

۲



Journal of Global Business and Technology

SELECTED CONTENTS

INNOVATION AND INVESTMENT MECHANISM FOR ENSURING THE **TECHNOLOGICAL COMPETITIVENESS OF UKRAINE IN THE DIGITAL**

Igor Matyushenko, Kamila Trofimchenko, Valery Ryeznikov, Olha Prokopenko, Serhii

DETERMINANTS OF FINTECH SERVICE CONTINUANCE BEHAVIOR: MODERATING ROLE OF TRANSACTION SECURITY AND TRUST Dewan Mehrab Ashrafi, Rabiul Hossain Dovash, and Mohammad Rokibul Kabir

CIRCULAR ECONOMY AND THE PORTUGUESE HOTEL INDUSTRY-AWARENESS, ATTITUDE, AND IMPACT ON THE ORGANISATIONAL

Berta Jose Fernandes Costa, Susana Cristina Serrano Fernandes Rodrigues, Carina

EXPLORING MINI-BUS TAXI ADVERTISING EFFECTS BASED ON THE THEORY OF HIERARCHY-OF-EFFECTS: A SOUTH AFRICAN COMMUTER

DIGITAL FINANCIAL INCLUSION: A SYSTEMATIC LITERATURE REVIEW

In Cooperation with the Global Business and Technology Association

The Journal of Global Business and Technology

Volume 18, Number 2, Fall 2022

Publisher

Global Business and Technology Association, Inc. (GBATA) 22 Cobblers Lane Dix Hills, New York 11746 U.S.A.

Publication Details

Two issues per volume ISSN 1553-5495 (Print) ISSN 2616-2733 (Online)

Published in the United States of America, 2022.

© Copyright

۲

The copyright of all material published in the journal is held by the Global Business and Technology Association, Inc.

Website

Further information, including subscription details, are available on the Global Business and Technology Association website at: www.gbata.org

All full papers submitted to the Journal of Global Business and Technology are subject to a double-blind peer reviewing process, using subject specialists selected for their expert knowledge.

The Journal of Global Business and Technology, in cooperation with the Global Business and Technology Association, is listed with [1] Scopus, [2] Cabell's International Journalytics, [3] EBSCO's Academic Search, and [4] ProQuest's database including the International Bibliography of Social Sciences (IBSS). This allows researchers from throughout the world to access articles from the journal.

()

COVER 3

۲

TABLE OF CONTENTS

N. Delener	Editorial	iv
N. Delener F. Victor Lu	Note from the Editors	x
	Editorial Board and Reviewers	
		xi
Igor Matyushenko	INNOVATION AND INVESTMENT MECHANISM	
Kamila Trofimchenko	FOR ENSURING THE TECHNOLOGICAL	
Valery Ryezniko	COMPETITIVENESS OF UKRAINE IN THE	
Olha Prokopenko,	DIGITAL ECONOMY	
Serhii Hlibko		
Yuliia Krvkhtina		

Abstract: In the context of the rapid development of globalization of the world economy, technological changes, improvement of innovative potential and investment attractiveness are potent factors of economic growth and prosperity and act as the main indicators of the technological competitiveness of countries in the world arena. The study aims to assess the technological competitiveness of Ukraine in comparison with the leading countries and the formation of an innovation and investment mechanism to improve it. The article presents the scheme of research on the technological competitiveness of Ukraine and the leading countries based on qualitative and economic-statistical analysis, analysis of comparative advantages, grouping method and correlation-regression analysis. The study of world rankings showed that the countries leading in the innovation and digital competitiveness indexes also occupy the first positions in the Global Competitiveness Index. Analysis of foreign trade in high-tech products showed that the studied countries occupy more than half of this market. The analysis of comparative advantages showed that Ukraine has the most significant preference for the export of aerospace products, Germany for pharmaceuticals, China for office equipment, the United States for instrument making, and only China for telecommunications. It was determined that France, China, and South Korea have the highest level of innovation in national exports, and Ukraine and the Russian Federation have the lowest. The calculation of the net investment activity of the countries showed that the countries are characterized by positive activity – the inflow of FDI to Ukraine, China, the United Kingdom, and the United States exceeds their outflow and in other countries vice versa. The innovative and investment mechanism was developed to ensure the technological competitiveness of economies based on the calculations. Based on the correlation and regression analysis, the main instruments for improving the technological competitiveness of Ukraine were identified, aimed at increasing the export of high-tech products; creation of research institutions, information centers, joint ventures with foreign companies and MNCs, regional innovation clusters; stimulating the attraction of foreign investment and improving legislation, etc. The authors' plan for developing Industry 4.0 of Ukraine has been developed, which provides recommendations for solving those problems that hinder the digitalization of the Ukrainian economy.

Dewan Mehrab Ashrafi	DETERMINANTS OF FINTECH SERVICE	35
Rabiul Hossain Dovash	CONTINUANCE BEHAVIOR: MODERATING	
Mohammad Rokibul	ROLE OF TRANSACTION SECURITY AND	
Kabir	TRUST	

Abstract: This study aims to examine the behavioral intentions for using fintech based applications from the lens of Information technology quality and trust-based model. Data were collected from 275 respondents through an online questionnaire by using the purposive sampling method. PLS-SEM was performed to test the impact of trust and risk on fintech continuance intention, and results showed that trust impacted continuance more than perceived risk. Moreover, information, service and system quality significantly impacted trust and perceived risk. The study also highlighted perceived risk and trust as mediators, and results showed that trust partially mediated the relationship between system, information, service quality and fintech continuance intention. Contrarily, perceived risk mediated the relationships between service and system quality and fintech continuance intention. This study enhances the theoretical depth and adds to the existing literature by presenting transaction security and trust as moderators. Results suggested that transaction security moderated the association between trust and fintech continuance intention. Additionally, trust showed to have a moderating impact on the relationship between perceived risk and fintech continuance intention. The study adds to the body of knowledge by emphasizing the role of trust and perceived risk as antecedents of behavioural intention to use fintechbased services. The study provides novel and meaningful insights and guidance for banks, fintech service providers, and policymakers to achieve a desirable position in the users' minds and design better experiences for customers by making the platform more innovative, reliable, and trustworthy.

..... 60

Berta José Fernandes	CIRCULAR ECONOMY AND THE
Costa	PORTUGUESE HOTEL INDUSTRY –
Susana Cristina Serrano	AWARENESS, ATTITUDE, AND IMPACT ON
Fernandes Rodrigues	THE ORGANISATIONAL PERFORMANCE
Carina Soares da Silva	
Maria Pilar Moreno	
Pacheco	

Abstract: Despite being one of the major integration means for migrants, labour market integration (LMI) remains understudied in the Global South. The extant literature on the LMI of female accompanying spouses is lacking. Skilled accompanying spouses can be considered economic migrants who may seek to exercise their agency in search of empowerment and economic self-sufficiency through LMI. The main objective of this research was to determine the meso governing technologies influencing the LMI of accompanying spouses in the Free State Province, South Africa, using Michel Foucault's theory of governmentality. Since South Africa remains a key regional hub for migration in the Global South, it is imperative that its migration governance framework considers accompanying spouses. A qualitative, interpretivist approach using 13 one-on-one interviews, which each lasted two hours on average, was adopted in this study. Thematic analysis was used to generate the findings. The study found that the meso-level governing technologies affecting the tied migrants' pursuit of LMI included family ties and traditional gender roles, diaspora expectations, visa processing challenges, the non-recognition of qualifications, and employer-related exclusion—mainly linked to what were perceived to be discriminatory and exclusionary practices. This study's findings can, to some extent, highlight issues that could inform South African immigration policy.

EXPLORING MINI-BUS TAXI ADVERTISING	86
EFFECTS BASED ON THE THEORY OF	
HIERARCHY-OF-EFFECTS: A SOUTH	
AFRICAN COMMUTER PERSPECTIVE	
	EXPLORING MINI-BUS TAXI ADVERTISING EFFECTS BASED ON THE THEORY OF HIERARCHY-OF-EFFECTS: A SOUTH AFRICAN COMMUTER PERSPECTIVE

Abstract: The out-of-home advertising media class and in particular transit advertising have not received the attention they deserve in the literature. The study explores minibus taxi advertising effects, guided by the hierarchy-of-effects theory. For a theoretical basis, out-of-home advertising media and transit advertising are conceptualised, the hierarchy-of-effects model and hypotheses development are discussed. Interview administrated surveys with regular minibus taxi commuters at a large taxi rank in South Africa were used to collect data. Results revealed significant relationships on cognitive and affective response levels. In terms of behavioural responses, attention paid to advertising was significantly related to positive word of mouth but not to the buying of advertised products. Some practical recommendations are offered to activate commuters' responses on cognitive-affective and behavioural levels. Downstream advertising effects, such as word-of-mouth and increased sales can be enhanced by marketers using integrated multimedia campaigns.

Subiakto Soekarno	DIGITAL FINANCIAL INCLUSION: A	
Marla Setiawati	SYSTEMATIC LITERATURE REVIEW	

Abstract: This study aims to identify gaps in digital financial inclusion (DFI). By examining the deficiencies in previous research methods, inequality variables, and variables related to DFI, it offers an important direction for further research. Inequality variables include gender, age, and disability. Variables related to DFI consist of education, security or safety, technology, and economy related to cost and income. Research gaps are identified using a systematic literature review and categories from three main aspects. Focusing on developing countries from literature data shows that the gap in the previous method lies in simulation and action research, and the gap in inequality variables involves age and disability. The gap in variables related to digital financial inclusion involves education, safety, and the economy. Overall, results of this study suggest that more research is required in the field of financial inclusion.

Manuscript Guidelines	110
JGBAT Subscription Forms	114

EDITORIAL

In a highly globalized and competitive world, the basis for a country's long-term economic growth is technological change and innovation. At the same time, the core of technological change and innovation is scientific development. According to the European Commission definition, technological competitiveness is the ability of a national economy to generate long-term economic growth, productivity, and well-being, through technological and innovative development. The **first paper by Igor Matyushenko, Kamila Trofimchenko, Valery Ryeznikov, Olha Prokopenko, Serhii Hlibko, & Yuliia Krykhtina** aims to assess the technological competitiveness of Ukraine, as well as the formation of an innovation and investment mechanism to improve it.

In order to visually show the place of Ukraine among other countries in the field of technology and innovation, nine countries were selected for comparison (USA, Canada, France, Germany, Great Britain, Russian Federation, China, South Korea and Japan) that are leaders in exports of high-tech goods as of 2020. A country's level of competitiveness depends on the food basket it exports. Thus, they argue that a country's export potential is affected by its income level (namely, GDP): high-tech goods can be exported by high-income countries. The greater the share of a country's high-tech products in world exports, the more competitive it will be. This position is confirmed by analyzing statistics from more than 100 countries.

The study of world rankings showed that the countries, leading in the innovation and digital competitiveness indexes, also occupy the first positions in the Global Competitiveness Index. The analysis of foreign trade in high-tech products showed that the studied countries occupy 55% of this market. Highly developed countries have 2-4% of GDP of R&D expenditures and a relatively low percentage of exports of ICT services (up to 10%). On the other hand, Ukraine has only 0.6% of GDP spending on science and development, a low ratio of high-tech exports goods in GDP (0.8%). However, the country has a very positive indicator for the export of ICT services –19% due to the strong development of the IT market. The analysis of comparative advantages showed that for some groups of goods some countries have quite good comparative advantages in the export of aerospace products, the United Kingdom and Ukraine have relative advantages, in pharmaceuticals – Germany and France, in office equipment – China and South Korea, in instrumentation – the USA and Germany, and for telecommunications equipment – only China.

The study by Matyushenko, Trofimchenko, Ryeznikov, Prokopenko, Hlibko, & Krykhtina makes three main contributions to the impact of technology development and innovation on the competition. The first one is the evaluation and comparison of the levels of technological and innovative development of Ukraine and the leading countries in this economic sector in terms of various indicators based on classical global indices. The second contribution is to show how a sustainable competitive advantage in technology and innovation affect the "strength" of the state. Using the latest technologies contributes to the emergence of new products and business models; larger markets encourage innovation and technology because the latter allows for less labor, lower product costs and faster production. The third main contribution is the development of a plan for the digitalization of the Ukrainian economy. It provides valuable input for government and businesses maneuvering in an increasingly digital market and opens up several avenues for further research.

Finally, it is essential to take into account the fact that the war of Russia against Ukraine (since February 24, 2022) by no means stopped the process of digital transformation but, on the contrary, actualized it even more. While key sources of export earnings, such as metallurgy and agriculture, are at high risk, with thousands of businesses shut down by the war and millions of people losing their jobs,

Ukraine is benefiting from businesses that continue to operate online. The export IT industry is the restoration of jobs, domestic demand for goods and services, and volunteer assistance to the army, hospitals, rescuers and others fighting for our freedom on the front lines. If before the war, no policy in the country would stimulate investment in the creation and modernization of new production facilities of modern industrial goods, now the state more than ever supports the introduction of digital technologies and the creation of new businesses (grants to small businesses to start their own business, IT start-ups, paying people for IT courses, opening IT clusters, etc.).

Traditional financial transactions are no longer the same as before, day-by-day it is getting revolutionized by Fintech. Fintech is significantly advancing traditional financial structures through major innovations that are providing a sustainable ecosystem for new and diverse financial businesses. That's why Fintech is fundamentally considered disruptive. New financial industries that have unique characteristics from the conventional ones can utilize it as an accelerator to sustain their economic growth. High expectations of Fintech growth have substantially increased Fintech investments worldwide. While both uncertainty and Information Technology have a significant impact on Fintech's sustainable growth, there are only a few studies that examined the connections between uncertainty, Information Technology, and continuous use of Fintech. Moreover, a comprehensive understanding of the interconnection between uncertainty, Information Technology, and continual usage of Fintech will assist providers of Fintech to attract and maintain customers efficiently, eventually speeding Fintech's popularization. Therefore, by adopting an IT quality-based viewpoint to a trust-based paradigm, the study investigated Fintech continuity intentions

The second paper by Dewan Mehrab Ashrafi, Rabiul Hossain Dovash, & Mohammad Rokibul Kabir aims to examine the behavioral intentions for using fintech based applications from the lens of Information technology quality and trust-based model. For assessing the validity and reliability, a pre-test was performed by concentrating on 27 respondents who used Fintech. The pre-test resulted in a major refinement. It restructured the questionnaire and developed the internal validity and initial face of the measures. Within the time frame of 2 months, questionnaires were circulated to 423 participants after the pre-test. Overall, data were collected from 275 respondents through an online questionnaire by using the purposive sampling method. The participants were provided with the survey form only if they met two criteria: i. participants must have heard of Fintech and ii. participants must have experience of using Fintech actively for more than 2 months. Through this purposive selection of respondents, the study aimed to confirm whether respondents were current users of Fintech and understood the survey context thoroughly. 71% responses came from mobile payment, 7% from mobile remittance and 22% from donation based crowdfunding. 35% of respondents used Fintech on a monthly basis whereas 12% of respondents used Fintech every six months. A large portion of respondents was aged between 18 to 30 years (35 %). Most of the respondents had a master's degree (49%) followed by a bachelor degree (38%).

PLS-SEM was performed to test the hypotheses of the study. The measurement model evaluated through ensuring content validity, convergent validity and discriminant validity. For each construct, the study measured the composite reliability (CR), average variance extracted (AVE), and Cronbach's alpha for the responsibility test. Additionally, all numbers of AVE surpassed the acceptance rate of 0.5. The authors assessed the inner VIF values to test whether there is any common method bias in the model and it was revealed that all of the values were below the required threshold. Therefore, the model was free from common method bias as no abnormality was detected. These observations proved the measurement model to be ideal for further study.

The bootstrapping results showed that trust impacted continuance more than perceived risk. Moreover, information, service and system quality significantly impacted trust and perceived risk. The study also highlighted perceived risk and trust as mediators, and results showed that trust partially mediated the relationship between system, information, service quality and fintech continuance intention. Contrarily, perceived risk mediated the relationships between service and system quality and fintech continuance intention. This study enhances the theoretical depth and adds to the existing literature by presenting transaction security and trust as moderators. Results of the Ashrafi, Dovash, & Kabir study suggested that transaction security moderated the association between trust and fintech continuance intention. Additionally, trust showed to have a moderating impact on the relationship between perceived risk and fintech continuance intention. Consequently, the authors believe that this research both theoretically and practically contributes to the existing body of literature. Additionally, the study provides novel and meaningful insights and guidance for banks, fintech service providers, and policymakers to achieve a desirable position in the users' minds and design better experiences for customers by making the platform more innovative, reliable, and trustworthy.

Despite presenting novel findings, this research is associated with several drawbacks, including some that indicate directions for future studies. The Ashrafi, Dovash, & Kabir study assessed unidimensional constructs of perceived risks and trust; multidimensional, multifaceted risk and trust were not studied. While the study was conducted focusing on an ISS model combined with a trust-oriented model, alternate frameworks may also clarify various links between the quality of Information Technology, perceived risk, trust, & the intentions of continuing Fintech. Lastly, this analysis is an overview that reflects on Fintech's post-adoption behavior; the dynamic and evolving nature of the Fintech-use phenomenon is not considered in the study. Henceforth, longitudinal studies can be conducted to evaluate the adoption patterns of Fintech over time.

The Portuguese tourism sector has been growing at a significant pace, with the hospitality indicator increasing since 2015 enabling the country to be internationally acknowledged as a strong, well-established, and sustainable tourism destination. Therefore, the Portuguese hotel industry is one of the sectorial areas that has consistently being growing in the economic, social and cultural spheres, which has further highlighted the environmental impact of its activities, and ultimately raised concerns on how these constrains have been addressed. In this perspective, the implementation of a Circular Economy model within the hotel industry would be a more advantageous economic model in order to guarantee resource conservation and environmental protection, and one that would allow companies to engage in competitive and advantageous business opportunities. Although, there is considerable research on the concept of Circular Economy, contemporary research on its implementation by the hotel industry as well as operational projects regarding its optimisation is scarce, especially in Portugal.

To address this gap, the third paper by Berta José Fernandes Costa, Susana Cristina Serrano Fernandes Rodrigues, Carina Soares da Silva, & Maria Pilar Moreno Pacheco conducts a quantitative research resorting to an online questionnaire disseminated to the Portuguese hotels, with the main purpose of examining Portuguese hotels level of awareness, attitude regarding the implementation of Circular Economy and its correlation with the companies' organizational performance. From the data analysis collected among 78 Portuguese hotels it can be concluded that there is awareness regarding the Circular Economy concept and its underlying principles amidst the group of participants. The findings also demonstrate that this particular group already implement some Circular Economy principles, with emphasis on the 3R-Principle (Reduce, Reuse, Recycle) along with Repair, which stand out as strategies that allow natural environment and resources protection, and sustainable management. These companies are already putting into practice numerous strategies and initiatives, namely water, energy, and waste management policies, the use of renewable or clean energies, as well as the use of environmentally sustainable materials, which in due time will allow a reduction of consumption and emissions, to cutting down operating costs and improve the company's environmental performance. The results also indicate that these companies are also considering cleaning management practices, the education and training of their staff with respect to more sustainable procedures, and towel and bed linen programmes are also being implemented.

Furthermore, the findings also indicate that the implementation of a Circular Economy paradigm not only enables companies to acquire new competences and access to new markets and consumers, but also allows the reduction of greenhouse gas emissions, which will ultimately increase companies overall performance. Results also highlighted the fact that five-star hotels that are part of international hotel chains located in the Lisbon region are more aware of the Circular Economy construct and are also putting into practice some R-Principles, which indicates that these companies have a more determined and proactive attitude regarding the implementation of a Circular Economy model. The research by Costa, Rodrigues, da Silva, & Pacheco adds new insights to the debate within the hotel industry by demonstrating that this group of Portuguese hoteliers is aware of the concept of Circular Economy and its R-Principles and are already implementing different strategies and measures that may allow them to gain competitive advantages.

Minibus taxi advertising refers to advertising displays affixed to the exterior of a minibus taxi. The largely informal and unregulated minibus taxi industry of South Africa plays a central role in the public transport sector and the country's economy. Minibus taxis remain the dominant mode of daily transport in this country. The out-of-home advertising media class and in particular transit advertising have not received the attention they deserve in the literature available to date. The **fourth paper by Thérèse Roux & Suzanne Lamprecht** aims to overcome this gap by exploring minibus taxi advertising effects based on the hierarchy-of-effects theory.

For a theoretical basis, the conceptualisation out-of-home advertising media is unpacked and then applied to minibus taxis advertising. A conceptual framework with four hypotheses relating to the correlation between key constructs measured on the three hierarchy of response levels (cognitive, affective and conative) is developed. Interview administrated surveys with 398 regular minibus taxi commuters at a large taxi rank in South Africa were used to collect data. A structured questionnaire with demographic questions and scales adopted from previous studies served as measuring instrument. The data were analysed using SPSS. The data were subjected to descriptive statistics as well as hypotheses testing via the Spearman's rank order correlation. The results of the study by Roux and Lamprecht revealed significant relationships on cognitive and affective response levels. In terms of behavioural responses, attention paid towards advertising was significantly related to positive word-of-mouth but not to the buying of advertised products.

Advertisers are advised to design advertising with impactful physical features and creative message content to entertain the captive commuters and offer help during their daily trips to attract attention amidst competing stimuli in the busy taxi rank environment. Commuters will become discouraged if content is irrelevant, boring or misleading. Advertisers could capitalise on the positive opinions towards advertising by providing the target market with the information they value on any new products developed and which could guide their purchase decisions. To drive downstream advertising effects marketers should integrate point-of-sale advertising media and use brand activations close to or inside stores where buying decisions are being made. To ensure sufficient exposure and repetition in a targeted area, taxi rank branding can be combined with minibus taxi advertising on the outside as well as inside the vehicle.

To keep commuters interested, large digital advertising screens at taxi ranks; live events or brand activations at targeted taxi ranks should be considered. This type of novel media could offer minibus taxi commuters with prolonged, meaningful interactions with brands to build brand affinity. If the aim is to increase sales, they should use promotional messages and content that help to address commuters' daily tasks or needs rather than generic messages aimed at just maintaining brand awareness. To increase the buying, demonstrations and free sampling can be activated at the ranks. The conflicting results in terms of behavioural responses of the current study and the limited past out-of-home advertising studies examining behavioural outcomes, direct the need for more research on this response level in future.

Digital financial services offer a variety of advantages, including easy access, flexibility, and realtime services. Based on these benefits, digital financial services are expected to be more widely adopted to increase financial inclusion. Financial inclusion ensures that all segments of society, including those with the lowest incomes, have equal access to regulated financial products and services. Digital technology has already emerged as a game-changing enabler in many industries, and it is now beginning to significantly impact financial services. Financial inclusion has the potential to be significantly impacted by digital financial services.

Examples of advantages are expansion of financial services to non-financial sectors, convenient and secure banking services for the poor, increase in aggregate expenditure in digitalized economies, boosted GDP of digitalized economies, reduced circulation of bad/fake money, and giving customers more control over their finances, allowing quick financial decisions and enabling them to make and receive payments in seconds, thus generating revenue for digital finance providers. In recent decades, the implementation of digital financial inclusion has evolved as a discipline, resulting in many methods, inequality factors, and variables related to digital financial inclusion. Digital financial services provide numerous benefits, including easy access, flexibility, and real-time services. Based on these benefits, digital financial services are expected to be more widely adopted to increase financial inclusion. Mobile financial services can also be more convenient and less expensive than traditional banking, allowing users to manage their money daily, act as financial controllers in their families, plan for the future, compare financial products, and keep themselves informed.

However, digital finance does not serve people who do not have mobile phones or digital devices; it is overly reliant on internet connectivity, which excludes people who do not have internet connectivity; and how digital finance is introduced in a country (voluntarily or forced) can lead to voluntary financial exclusion if the population is not ready for it. Fee-based digital finance platforms will benefit high- and middle-income individuals at the expense of poor and low-income individuals who cannot afford the associated transaction costs. In addition, many policy and regulatory environments do not support full-scale digital finance. Papers that disseminate as a literature review focus on those advantages and disadvantages; however, no research has elaborated on the categories of Digital Financial Inclusion. Therefore, the **fifth paper by Subiakto Soekarno & Marla Setiawati** focuses on the synthesis of selected categories in selected papers. Thus, Soekarno & Setiawati aim to synthesize research in Digital Financial Inclusion (DFI) so that gaps can be identified as directions for further research. The categories used in synthesizing previous research are, first, methods in previous studies. Second, aspects of inequality that occur in DFI consist of gender, age, and disability. Third, variables related to DFI include education, security or safety, technology, and cost or income (economy factor).

Since nearly half of the people in the developing world already own a mobile phone, digital finance has the potential to increase financial inclusion, expand financial services to non-financial sectors, and develop essential services for individuals. The importance of discussing inequality from gender, age, and disability is that many people lack access to these technologies, primarily affecting marginalized communities, particularly women and people with disabilities. Women, elderly people, and people with disabilities have unequal opportunities regarding the use of DFI.

The research by Soekarno & Setiawati was combined with an intensive literature review and was based on the division of categories consisting of the method, inequality in DFI, and variables involved in DFI. Several research gaps in each category can be an opportunity for future research. Most research has focused on gender inequality, but little research has discussed disability inequality. The methods in previous studies have gaps, such as in simulations and action research. First, action research has rarely been conducted because it poses a significant risk to the environment involved in DFI. The second gap is simulation, which has an advantage in DFI in that it allows the investigation of risks and policies, especially between actors, to minimize problems. From the variables involved in DFI, future research opportunities may involve education, safety or security, and cost and/or income (economy).

N. Delener, Ph.D. Editor-in-Chief

NOTE FROM THE EDITORS

As an interdisciplinary indexed journal, *The Journal of Global Business and Technology* (*JGBAT*) serves academicians and practitioners in the fields of global business and technology management and their related areas. JGBAT is also an appropriate outlet for manuscripts designed to be of interest, concern, and applied value to its audience of professionals and scholars.

Readers will note that our attempt to bridge the gap between theory and practice has been successful. We cannot thank our reviewers enough for having been so professional and effective in reiterating to contributors the need to provide managerial applications of their research. As is now obvious, the majority of the articles include a section on managerial implications of research. We wish to reiterate once again our sincere thanks to JGBAT reviewers for having induced contributors to answer the "so what?" question that every *Journal of Global Business and Technology* article is required to address.

Thank you for your interest in the journal and we are looking forward to receiving your submissions. For submissions guidelines and requirements, please refer to the Manuscript Guidelines at the end of this publication.

N. Delener, Ph.D., Editor-in-Chief F. Victor Lu, Ph.D., Managing Editor

Journal of Global Business and Technology EDITORIAL BOARD

EDITOR-IN-CHIEF

MANAGING EDITOR

N. Delener, Ph.D. York College of Pennsylvania, U.S.A. F. Victor Lu, Ph.D. St. John's University, U.S.A.

REGIONAL EDITORS

	Johan de Jager, Ph.D.
AFRICA	Tshwane University of Technology, South Africa
	Stephen Ko, Ph.D.
	The Hong Kong Polytechnic University, China
ASIA	
	Pawan K. Chugan, Ph.D.
	Nirma University, India
	Leon de Wet Fourie, Ph.D.
	Toi Ohomai Institute of Technology, New Zealand
AUSTRALIA/NEW	
ZEALAND	Bruno Mascitelli, Ph.D.
	Swinburne University of Technology, Australia
	Shaukat Ali, Ph.D.
	The University of Wolverhampton, U.K.
FUROPE	Anna Putnova, Ph.D.
LERGIL	Brno University of Technology, Czech Republic
	Susana Rodrigues, Ph.D.
	Polytechnic Institute of Leiria, Portugal
	Dana Lascu, Ph.D.
	University of Richmond, U.S.A.
	Carald Ladlow, Dh D
	Gerald Lediow, Ph.D.
NORTH AMERICA	University of Texas Health Science Center at Tyler, U.S.A.
	Pat Ohi Ph D
	Purdue University Northwest US A
	i urdue Oniversity Northwest, 0.5.A.
	Luis Eduardo Rivera Solis, Ph.D.
	Capella University, U.S.A.
	T. Diana L. v. A. de Macedo-Soares, Ph.D.
SOUTH AMERICA	Pontifical Catholic University of Rio de Janeiro, Brazil

REVIEWERS

Dr. Davood Askarany, University of Auckland, New Zealand Dr. Erhan Aslanoglu, Piri Reis University, Turkey Dr. Tamer Mohamed Atef, University of Sadat City, Egypt Dr. Alba Caicedo Barreth, University of Guayaquil, Ecuador Dr. Homer T. Bonitsis, New Jersey Institute of Technology, U.S.A. Dr. Vida Lucia Botes, University of Waikato, New Zealand Dr. Gordon Bowen, Northumbria University, U.K. Dr. Piotr Bula, Cracow University of Economics, Poland Dr. Dagmar Caganova, Slovak University of Technology in Bratislava, Slovakia Dr. Hong Long Chen. National University of Tainan. Taiwan R.O.C. Dr. Koen Dittrich, Erasmus University of Rotterdam, The Netherlands Dr. Zenzo Dube, National University of Science and Technology, Zimbabwe Dr. Maria Eduarda da Silva Teixeira Fernandes, Polytechnic Institute of Leiria, Portugal Dr. Nikolay Filinov, National Research University-Higher School of Economics, Russia Dr. Hisao Fujimoto, Osaka University of Economics, Japan Dr. Leonora Fuxman, St. John's University, U.S.A.

Dr. Rute Abreu, Instituto Politécnico da Guarda, Portugal

Dr. Eric Girard, Siena College, U.S.A.

Dr. Abdel Halabi, Federation University, Australia

Dr. Frederic Jallat, ESCP Europe - European School of Management, France

Dr. Yamen Koubaa, EM Normandie Ecole de Management, France

Dr. Halil Kiymaz, Rollins College, U.S.A.

Dr. Stephen Ko, The Hong Kong Polytechnic University, China

Dr. Samad Kolahi, UNITEC Institute of Technology, New Zealand

Dr. Daniel Koys, DePaul University, U.S.A.

Dr. Ines Lisboa, Polytechnic Institute of Leiria, Portugal

Dr. José Luís Martins, Polytechnic Institute of Leiria, Portugal

Dr. Miguel Martins, University for the Creative Arts, U.K.

Dr. Ajay K. Manrai, University of Delaware, U.S.A.

Dr. Samir R. Moussalli, Huntingdon College, U.S.A.

Dr. Juergen Muehlbacher, Vienna University of Economics & Business, Austria

Dr. Marina Novelli, University of Brighton, U.K.

Dr. Wilson Ozuem, University of Cumbria, U.K.

Dr. Kathleen Park, Boston University, U.S.A.

Dr. Nathalie Prime, ESCP Europe-European School of Management, France

Dr. Maria Reznakova, Brno University of Technology, Czech Republic

Dr. Leonel Cezar Rodrigues, University Nove de Julho, Brazil

Dr. Luis Lima Santos, Polytechnic Institute of Leiria, Portugal

Dr. Christina Schweikert, St. John's University, U.S.A.

Dr. Mabutho Sibanda, University of Kwazulu-Natal, South Africa

Dr. Klaus Solberg Soilen, Blekinge Institute of Technology, Sweden

Dr. Carlos Trevia, Pontifical Catholic University of Rio de Janeiro, Brazil

Dr. Hugo van Schalkwyk, North-West University, South Africa

Dr. Elina Varamaki, Seinäjoki University of Applied Sciences, Finland

Dr. Ondrej Zizlavsky, Brno University of Technology, Czech Republic

INNOVATION AND INVESTMENT MECHANISM FOR ENSURING THE TECHNOLOGICAL COMPETITIVENESS OF UKRAINE IN THE DIGITAL ECONOMY

Igor Matyushenko, Kamila Trofimchenko, Valery Ryeznikov, Olha Prokopenko, Serhii Hlibko, and Yuliia Krykhtina

Received June 30th, 2022; Revised August 27th, 2022; Accepted September 22nd, 2022

ABSTRACT

In the context of the rapid development of globalization of the world economy, technological changes, improvement of innovative potential and investment attractiveness are potent factors of economic growth and prosperity and act as the main indicators of the technological competitiveness of countries in the

Kamila Trofinchenko is a Master's Student in International and European Economic Integration. She holds the Bachelor Degree in International Economic Relations from V.N. Karazin Kharkiv National University. She is a Project Manager at the NGO "Fund Professional Development of Kharkiv". Kamila Trofinchenko is a winner of the All-Ukrainian competition of student scientific works "Actual issues of cooperation with the European Union" in 2021. She also obtained a scholarship from the Kharkiv City Council for scientific and research activities in 2021/2022.

Valery Ryeznikov is Professor at the Department of International Economic Relations, Dean of the Faculty of International Economic Relations and Tourist Business at the V.N. Karazin Kharkiv National University. He holds academic degrees of Doctor of Public Administration and PhD in Economics. Ryeznikov is an expert of the European educational project Jean Monnet Module 600222-EPP-1-2018-1-UA-EPPJMO-MODULE 2018-2021 "Foreign Policy of the European Union", the European educational project Jean Monet Module 611674-EPP-1-2019-1-UA-EPPJMO-MODULE 2019-2022 "European Integration of Ukraine in Industry 4.0", and NGO "Platform of Public Diplomacy".

Igor Matyushenko is Professor at the Department of International Economic Relations at the V.N. Karazin Kharkiv National University and Principal Researcher at the Scientific and Research Institute of Providing Legal Framework for the Innovative Development of National Academy of Legal Sciences of Ukraine. He holds the academic degrees of Doctor of Economics and PhD in Engineering. Matyushenko is the Head of the European educational project Jean Monet Module 611674-EPP-1-2019-1-UA-EPPJMO-MODULE 2019-2022 "European Integration of Ukraine in Industry 4.0". He is Full Member of the Academic Union Oxford (the UK). He received the I Degree award from VN Karazin Kharkiv National University in 2017 and the award of the National Academy of Sciences of Ukraine in 2020.

Olha Prokopenko is Professor and Researcher at the Estonian Entrepreneurship University of Applied Sciences (Estonia) and Sumy State Pedagogical University (Ukraine). She holds the academic degree of Doctor of Economics. Prokopenko has received two research grants from the President of Ukraine, two research scholarships from the Cabinet of Ministers of Ukraine, the Research scholarship from the Queen Jadwiga Scholarship Fund and the Research scholarship from the National Scholarship Programme of the Slovak Republic. She is awarded M.I. Tugan-Baranovsky Gold medal and Honorary Diploma of Georgia National Institute of Economic Research.

Serhii Hlibko is Associate Professor, Head of the Scientific Research Institute of Providing Legal Framework for the Innovative Development of the National Academy of Legal Science of Ukraine. He holds the academic degree of PhD in Law. He is also Head of the research topic "Legal support of the innovation process of global challenges" (state registration number 0120 U 104786), 2021-2024. His research interests embrace innovation, banking law, and economic law.

Yuliia Krykhtina is Associate Professor at the Department of Management and Administration at the Ukrainian State University of Railway Transport. She holds the academic degree of PhD in Economics. Krykhtina teaches the course of Public management and administration. Her research interests are management of financial and economic risks, logistics, foreign economic activity, and economic aspects of public administration and governance.

world arena. The study aims to assess the technological competitiveness of Ukraine in comparison with the leading countries and the formation of an innovation and investment mechanism to improve it. The article presents the scheme of research on the technological competitiveness of Ukraine and the leading countries based on qualitative and economic-statistical analysis, analysis of comparative advantages, grouping method and correlation-regression analysis. The study of world rankings showed that the countries leading in the innovation and digital competitiveness indexes also occupy the first positions in the Global Competitiveness Index. Analysis of foreign trade in high-tech products showed that the studied countries occupy more than half of this market. The analysis of comparative advantages showed that Ukraine has the most significant preference for the export of aerospace products, Germany for pharmaceuticals, China for office equipment, the United States for instrument making, and only China for telecommunications. It was determined that France, China, and South Korea have the highest level of innovation in national exports, and Ukraine and the Russian Federation have the lowest. The calculation of the net investment activity of the countries showed that the countries are characterized by positive activity – the inflow of FDI to Ukraine, China, the United Kingdom, and the United States exceeds their outflow and in other countries vice versa. The innovative and investment mechanism was developed to ensure the technological competitiveness of economies based on the calculations. Based on the correlation and regression analysis, the main instruments for improving the technological competitiveness of Ukraine were identified, aimed at increasing the export of high-tech products; creation of research institutions, information centers, joint ventures with foreign companies and MNCs, regional innovation clusters; stimulating the attraction of foreign investment and improving legislation, etc. The authors' plan for developing Industry 4.0 of Ukraine has been developed, which provides recommendations for solving those problems that hinder the digitalization of the Ukrainian economy.

Keywords: technological competitiveness, innovation and investment mechanism, advanced technologies, high-tech products

INTRODUCTION

Presently, in a highly globalized and competitive world, technological change and innovation are the basis of the long-term economic growth of any prosperous country. Consequently, the development of economic policy-based countries, based on the development of the scientific, technological, and innovation environment, will contribute to their sustainable economic growth and global competitiveness. At the same time, in the conditions of competition's intensification in foreign and domestic markets for the world's leading countries, the problem of advanced production technologies' introduction of the new industrial revolution is substantially aggravated (Prokopenko et al., 2019).

In a highly globalized and competitive world, the basis for a country's long-term economic growth is technological change and innovation. At the same time, the core of technological change and innovation is scientific development. In this context, countries should formulate economic policies to develop a science, technology, and innovation environment in society and the economy that will promote sustained economic growth and global competitiveness (Prokopenko & Kasyanenko, 2013; Sener & Saridogan, 2011).

Technological readiness is a crucial element in the growth of each national economy. It is impossible to imagine any aspect of human activity without technological tools. In addition, the technology significantly shapes lifestyles, work, and communication in modern societies (Polishchuk et al., 2019). Given this vital role in social life and business, the results achieved in technological readiness largely determine the quality of life of citizens and the attractiveness of a given country's economy. Consequently, the level of competitiveness in terms of technological readiness largely determines the overall competitiveness of a national economy in the global world. These are the main reasons why

technological readiness requires special treatment in formulating a country's strategic development and should be monitored and improved in every national economy that advocates an open development model (Radivojevic et al., 2018).

Achieving and maintaining competitiveness requires a constant increase in productivity and constant adaptation to changes in the economic environment (European Investment Bank, 2016). When change is the only constant, an economy that can attract new ideas, methods, or products faster than others will have an advantage. That is why technological opportunities and innovations can accelerate the growth and development of any economy (The Global Competitiveness Report, 2013; 2014; 2015; 2016; 2017; 2018; 2019). Thus, competitiveness now is the ability to manage change and adapt to it through innovation.

According to the European Commission definition, technological competitiveness is the ability of a national economy to generate long-term economic growth, productivity, and well-being, through technological and innovative development. Such development requires an environment for innovation and has the following elements: a high level of education; investment in research and development; and a developed innovative infrastructure, including high-quality research institutions capable of generating knowledge and supporting new technologies; extensive cooperation in scientific and technological development between universities and industry; protection of intellectual property rights, high levels of competition and access to venture capital and finance (Priede & Pereira, 2013).

The importance of traditional competitive advantages has diminished considerably in the twentyfirst century, and it is only through participation in the technological competition in the world market that the competitiveness of national economies is now substantially enhanced (Krupskyi et al., 2019). According to K. Holroyd, supporting scientific and technological innovation in the long term constitutes the primary source of competitive advantage (Holroyd, 2007). In most cases, the technological competitiveness of an economy is described by researchers in the context of the impact of a technological factor on the dynamics of foreign trade, innovative competitiveness or innovative support for industrial modernization (Fedulova, 2008).

Research is gradually reflecting technological competitiveness in measuring the domestic development potential of a country's economy. According to K. Momaya, technological competitiveness is the ability to develop, transfer, absorb, produce, or commercialize technologies to maintain competitiveness (Momaya, 2001; 2014). J. Fagerberg linked technological competitiveness with innovation potential (Fagerberg, 1988). It is also the position of M. Cassidy and D. O'Brien, who, by technological competitiveness, understand the innovative and adaptive potential of the economy (Cassidy, 2007). J. Howells defines a country's scientific and technological competitiveness as a country's ability to create and retain competitive advantages in the generation, diffusion and application of new knowledge through efficient use, building and modernizing its scientific and technological capacity in the context of globalization (Howells & Michie, 1998).

In our view, an approach to analyzing the economy's competitiveness in terms of technological capabilities suggests that competitive differences among countries arise because of differences in their technological capabilities, that is, their ability to absorb, adapt, and efficiently use technology for development efficiency and productivity. By 2030, world-renowned institutions and international industry associations are predicted to be able to launch a revolution in industrial production only by introducing, first and foremost, high-tech industries. The wave of the new industrial revolution will drive the rise of new digital industrial technologies known as Industry 4.0, based on industries such as nanomaterials, 3D printing, genetic engineering, molecular biotechnology, cloud computing, multidimensional modeling, the Internet of Things, and artificial intelligence (OECD, 2015; The future of manufacturing..., 2014).

INNOVATION AND INVESTMENT MECHANISM

The study aims to assess the technological competitiveness of Ukraine, as well as the formation of an innovation and investment mechanism to improve it. In order to visually show the place of Ukraine among other countries in the field of technology and innovation, in our study we took nine countries for comparison (USA, Canada, France, Germany, Great Britain, Russian Federation, China, South Korea and Japan) that are leaders in exports of high-tech goods as of 2020. According to economists such as Hausmann and Klinger (2006), Hidalgo (2009), América & Zamora-Torres (2014), Balcerzak (2015), Becker et al. (2012), Fagerberg (1996), a country's level of competitiveness depends on the food basket it exports. Thus, they argue that a country's export potential is affected by its income level (namely, GDP): high-tech goods can be exported by high-income countries. The greater the share of a country's high-tech products in world exports, the more competitive it will be. This position is confirmed by analyzing statistics from more than 100 countries.

Our paper makes three main contributions to the impact of technology development and innovation on the competition. First, to evaluate and compare the level of technological and innovative development of Ukraine and the leading countries in this economic sector in terms of various indicators based on classical global indices. Based on these data, to develop an innovative and investment mechanism for increasing the technological competitiveness of Ukraine, which covers the full range of necessary steps in the required sequence. Thus, our concept can be an auxiliary tool for ministries and companies in their reorientation towards digitalization.

Our second contribution is to show how a sustainable competitive advantage in technology and innovation affect the "strength" of the state. That is, the growing digitalization and development of technologies directly affect the technological competitiveness of countries. Using the latest technologies contributes to the emergence of new products and business models; Larger markets encourage innovation and technology because the latter allows for less labor, lower product costs and faster production. By focusing on the total digitalization of business processes, developing advanced technologies and enhancing innovative potential, countries will increasingly increase their technological competitiveness.

The third main contribution is the development of a plan for the digitalization of the Ukrainian economy. It provides valuable input for government and businesses maneuvering in an increasingly digital market and opens up several avenues for further research. We believe that the competitiveness of countries increasingly depends on the country's future orientation and ability to improve the population's skills, update legislation and social norms that promote the development of the digital economy and are aimed at innovative changes, cooperation, ideas and information.

LITERATURE REVIEW

A wide range of foreign economists and analysts study the impact of technological changes and industrial revolutions on the country's international competitiveness. In addition, many well-known scientists offer their methods for assessing the country's technological competitiveness depending on the influence of various macro-environment factors and the direct impact of export volumes and structure on competitiveness.

In their works, Johnson et al. (2010) show that Western European nations, along with the USA and Japan, have been recognized as the most competitive economies in the world. Eastern European countries are generally considered to be lagging. They are examining the accuracy of these descriptions and the prospects for change in the coming decade. Georgia Tech 'High Tech Indicators' (HTI) contributes to the National Science Foundation (NSF) Science & Engineering Indicators. They cover 33 highly developed and rapidly industrializing countries. Our model of technological competitiveness contains four components: National Orientation, Socioeconomic Infrastructure, Technological

Infrastructure, and Productive Capacity that promote 'Technological Standing'. They present indicator values, derived from survey and statistical panel data, for 13 European nations (plus the USA as a benchmark), for 1993-2005 and draw inferences about future high-tech competitiveness. We are witnessing limited technological progress in the Eastern European States. The outlook for Europe is somewhat uncertain, given the sharp increase in competition from Asia.

Porter et al. (2014) showed that the Georgia Institute of Technology, with the support of the National Science Foundation, had completed a decade of developing national high-tech competitiveness indicators. This paper reports on the standing, emphasis, and rate of change of high-tech competitiveness for 28 nations. Results show strong standing for the '4 Asian tigers', comparable to many Western European countries. Their five '6 Asian Cubs' are experiencing rapid growth in high-tech production and export opportunities; the four tigers are no longer growing fast. Patterns are also presented and discussed for 'the Big 3' (Japan, USA, Germany), three non-European developed economies, two former Eastern Bloc countries, and three Latin American nations. Their group of 180 experts predicts a surge in global high-technology export competition over the next 15 years.

At the same time, today, all countries must take into account the influence of the main factors of the new industrial revolution. The most widespread concept today, Industry 4.0, was named in 2011 by German businessmen, politicians, and scientists, who identified it as a way of increasing the competitiveness of the German manufacturing industry through the enhanced integration of "cyber-physics systems" (or CPS) into production processes. In the report (Kagermann et al., 2013), the main points of this concept were formulated. Its further development was described in the works of Ross (2016) and Schwab (2016), which emphasize that today's advanced production technologies are mainly 3D printing, cloud technology, Internet things, new materials, robotics, and artificial intelligence.

Thus, we can conclude that Industry 4.0 technologies, combining the factors Smart TEMP (T (technology) – smart technologies, E (environmental) – smart environment, M (manufacturing) – smart production, P (products) – smart products), create new markets and industries, contribute to the growth of labor productivity, the competitiveness of sectors and national economies (Matyushenko, 2016; 2017a; 2017b).

The Fagerberg paper (1996) provides an overview of the literature on technology and competitiveness. First, the concept of a country's international competitiveness and various theoretical approaches to the relationship between trade and growth are discussed. A few empirical studies on the impact of technology (as evidenced by R&D, patents, etc.) on exports are then examined. As a result, the authors summarize the findings and discuss lessons for policy. Moreover, América and Zamora Torres (2014), based on foreign experience, argue that the share of high-tech products delivered to world markets is directly dependent on the development of national innovation infrastructure.

The question of improving the economic performance in the EU countries and finding an effective response to the current global challenges is directly linked to the widespread introduction of these advanced industrial technologies by the new industrial revolution in European countries (Balcerzak, 2015; Barca et al., 2012; Becker et al., 2012; Prokopenko et al., 2018).

Many economists have examined specific aspects of the impact of a country's export capacity on its competitiveness in world markets. Thus, Hausmann and Klinger (2006) used one approach to assess the export potential for competitiveness. Looking at the "commodity space" of world exports, they note that a country's level of competitiveness depends on the food basket it exports. The greater the share of a country's high-tech products in world exports, the more competitive it will be. This position has been confirmed by analyzing statistics from more than 100 countries. Building on this view, Hidalgo & Hausmann (2009) argues that a country's export potential is influenced by a country's income level

INNOVATION AND INVESTMENT MECHANISM

(namely, GDP): high-tech goods can be exported by high-income countries. This point cannot be unconditionally and unequivocally accepted concerning individual countries.

Melnik (2008) argues that the components of export potential include the potential of internal resources (a function of the technical and technological base, staff qualifications, management methods and finance) and the potential of the target foreign market. Market access conditions include national (trade policy of the country, the system of support for export production) and external conditions (trade regime of the exporting country). Indeed, these factors influence the formation of export potential. However, Melnik only points to the functional dependence of export potential on these indicators without further formalization. Therefore, it is not possible to practically use the approach.

Countries are developing locally: around the "center countries" of production and export of goods are "satellite countries" with similar economic indicators because of their close trade links. To forecast exports, Kireiev (2001) proposes to use regression equations of supply and demand. This equation is based on the assumption of the existence of global development cycles. Accordingly, the demand for national products of the country is determined based on the sum weighted by the correction factors of real-world GDP and the export price index.

Bogomazova (2003) also provides a regression model for estimating export potential, describing the country's exports based on three variables: the nominal exchange rate of the hryvnias against the US dollar, foreign direct investment inflows into Ukraine, and industrial and agricultural growth rates. In our opinion, such a model does not fully characterize the possibilities of forecasting Ukraine's exports because regression models are pretty tricky. After all, the economic situation is changing very quickly.

In assessing the impact of regulatory authorities on the foreign trade of high-tech products in Ukraine, scientists note the possibility of using cause-effect relationships between indicators characterizing the market's business processes and government regulatory instruments that can be quantified (Sushchenko & Trunina, 2016; Koval et al., 2019). Thus, each of these methodological approaches to assessing the country's competitiveness, taking into account the export potential of the economy, has unique features, advantages, and analytical components.

In our opinion, the strength of the methodological approach is Johnson et al. (2010), Porter et al. (2014) is the use of four components in the technology competitiveness model – national orientation, socio-economic infrastructure, technological infrastructure, and productive potential, as well as the use of high-tech technology indicators to assess their competitiveness. In addition, the authors influence the export of technology (based on research and development, patents, etc.). At the same time, such research requires processing a large amount of statistical information, which is often difficult for ordinary researchers to access. We believe a qualitative analysis based on comprehensive indicators is helpful for a comprehensive and sufficiently simple assessment of a country's technological competitiveness.

Scientists and business analysts such as Kagermann et al. (2013), Ross (2016) and Schwab et al. (2020) investigated the influence of the factors of the new industrial revolution on the technological competitiveness of the country. At the same time, they concluded that today, in the context of insufficient statistics on the impact of specific breakthrough technologies on the country's economic development, the best quality indicators of the country's technological competitiveness remain integral indicators, primarily such as Global Competitiveness Index of World Economic Forum, the Global Innovation Index (Dutta et al., 2020), IMD World Competitiveness Ranking and others.

Another group of scientists (América & Zamora-Torres, 2014; Balcerzak, 2015; Becker et al., 2012; Fagerberg, 1996; Hausmann & Klinger, 2006; Hidalgo & Hausmann, 2009; Bogomazova, 2003; Kireiev, 2001; Koval et al., 2019; Melnik, 2008; Sushchenko & Trunina, 2016) investigated the impact of trade in technological goods on economic growth and conducted various assessments of the impact of a

country's export potential on its technological competitiveness. An analysis of the results of these studies showed that indicators such as the ratio of high-tech exports to GDP of a country, the ratio of the number of employees involved in research and development to the employed population of the country, the ratio of research and development expenditure (R&D expenditure) to the country's GDP, relative (comparative) country advantages by product group and other categories are helpful for a comprehensive assessment of a country's export potential. These indicators are often used to assess a country's export potential comprehensively and to identify its exports' comparative advantages.

Based on the concepts and models of several economists, in our article, we intend to explore the following data: world indices (Global Competitiveness Index, Global Digital Competitiveness Index and Global Innovation Index) (Hausmann and Klinger, 2006), the ratio of high-tech exports in the structure of industrial exports (Hidalgo & Hausmann, 2009; América and Zamora Torres, 2014), high-tech exports to national GDP (Melnik, 2008; Bogomazova, 2003), information and communication services exports (European Innovation Scoreboard, 2018), R&D expenditure to national GDP (Becker et al., 2012), comparative advantages of the country by product groups (Melnik, 2008; Kireiev, 2001; Koval et al., 2019), we also study the level of innovativeness of exports (Sturges, H.A., 2012; Sushchenko & Trunina, 2016) and define the investment activities of countries (Gorzhi, 2017).

Thus, the problem arises of some combination of these methodological approaches to establish a comprehensive and relatively simple methodological approach to assessing the country's technological competitiveness (as in the case of Ukraine), taking into account the impact of the new industrial revolution. However, all these indicators will allow us to comprehensively analyze Ukraine's technological competitiveness and the leading countries from different angles. We do not have a goal to combine them as interconnected components. Our task is to provide the most up-to-date analysis of the level of technology development in countries and the rate of penetration of digital business processes based on various panel statistics.

RESEARCH METHODOLOGY

Analyzing a country's competitiveness in technology and innovation remains challenging due to many constantly changing influencing factors. Nevertheless, the study of the theoretical definition of technological competitiveness and the basis for the functioning of the global competitive environment allows us to develop a methodology for studying the technological competitiveness of countries. So, we formed the main stages of our research as follows:

I. Assess the technological competitiveness of the leading countries and Ukraine using qualitative analysis.

This study proposes to carry out calculations based on the data of the Global Competitiveness Index (WEF), among the 12 indicators of which the indicators 3rd pillar: ICT adoption, 12th pillar: Innovation capability, 2nd pillar: Infrastructure and 11th pillar: Business dynamism reflect the technological competitiveness of countries as much as possible (Hausmann and Klinger, 2006).

The technical readiness indicator determines the level of use by the economy of available technologies to increase the efficiency and productivity of its industries, assesses the readiness and ability to use ICT in everyday life and production, etc. The innovation potential indicator looks at the development of an environment that creates a good platform for innovation, that is, the availability of sufficient funding for research and development, a high level of development of research institutions, protection of intellectual property, and well-established cooperation between government, academia and business. The Business Development Indicator covers broader factors such as administrative requirements

and entrepreneurial culture. This indicator also allows assessing the innovation ecosystem of each economy (The Global Competitiveness Report 2017-2018).

For a more global assessment of the technological competitiveness of countries, we add the "Infrastructure" indicator to the analysis. In order to increase the competitiveness of the national economy, that is its innovative potential. First of all, it is necessary to improve the quality of institutions, improve infrastructure, the quality of education and training, and also solve problems with the efficiency of the market for goods and services, which, in turn, will have a positive impact on the current level of technological development (Alekseev, 2014).

The following index is the Digital Competitiveness Index, calculated by the IMD Center for International Competitiveness. The index includes three factors of digital competitiveness – "Knowledge" (having the skills necessary to study and implement advanced technologies), "Technology" (the level of activation of digitalization development - the degree of funding, assessment of legislation in the field of science and technology, etc.), and "Readiness for the future" (assessment of the degree of readiness for the introduction of innovations, widespread digitalization, from the government to a single citizen) (IMD World Digital Competitiveness Ranking, 2019). By analyzing the data of this index, it is possible to assess the ability of economies to carry out digital transformations in public administration, business processes and the population's life.

The paper also considers the Global Innovation Index, which gives a detailed assessment of the innovative activity of world economies. It includes 80 indicators that provide a relatively broad vision of the political and economic environment, the level of education, the degree of infrastructure development and the complexity of doing business (Dutta et al., 2020).

II. Analysis of foreign trade in high-tech products of the countries under study.

We determined that the export of high-tech products is one of the main indicators for assessing the technological competitiveness of a country since these are usually goods with a high value-added, the export of which brings high incomes to the economy. So, the goal is to perform the following tasks:

- to determine the share of exports of high-tech products of the studied countries in world exports.
- to analyze the ratio of high-tech exports to industrial exports of countries according to the World Bank data (Hidalgo & Hausmann, 2009; América and Zamora Torres, 2014);
- study the dynamics of exports of ICT services (European Innovation Scoreboard, 2018).
- III. For the study of the main comparative advantages of Ukraine's high-tech trade, it is proposed to use the Melnik (2008), Bogomazova (2003), Kireiev (2001), Koval et al. (2019) methodology and analyse the following indicators:
- the ratio of exports of high-tech goods to the country's GDP:

$$QE_{HQ} = \frac{E_{HQ}}{GDP} \times 100\%$$
(1)

- the ratio of research and development expenditure (R&D expenditure) to the country's GDP:

R&D expenditure × 100% GDP of the country

(2)

the indicator of the relative or comparative advantage of the country. The country's (i) comparative advantage coefficient (CA) for a given product group or industry (j) is an indication of whether a country has a relative advantage in the exports of a particular product group or whether this advantage is shared by its partners:

$$CA_{ij} = ln [(Ex_{ij}/Im_{ij}) / (Ex_i/Im_i)]$$

(3)

(5)

- Exij, Imij export and import of j-goods of the i-country;
- Exi, Imi –export and import of the i-country.
- IV. Grouping of the leading countries and Ukraine by the innovativeness of national exports (Sturges, H.A., 2012; Sushchenko & Trunina, 2016).

The innovativeness of a country's exports is determined using the Sturges formula (2012) in terms of the share of high-tech exports in countries' total exports. First, the coefficient k is calculated using the following formula:

$$k = 1 + 3.322 lg N$$
 (4)

- N -the number of countries under study.

The resulting coefficient k divides the set of countries into a certain number of groups n, and the value of the number of equal intervals between these groups h is calculated using the following formula:

$$h = (E_{Tmax} - E_{Tmin}) / n$$

-

ETmax– the maximum ratio among countries of the volume of exports of high-tech products to the entire export of the country.

- ETmin- accordingly, the minimum ratio.

Ultimately, it will be got a certain number of intervals in the studied set of countries and indicate the degree of innovativeness of the national exports of a particular group.

V. Determination of the net investment activity of the leading countries and Ukraine is one of the main factors in the innovative development of countries (Gorzhi, 2017).

The level of the country's net investment activity (NIA) in this case is defined as the ratio of the difference between attracted and exported investments in the amount of the same values according to the following formula:

$$NIA = ((IV_{FDI} - EV_{FDI})/(IV_{FDI} + EV_{FDI})) \times 100\%$$
(6)

- IVFDI- the volume of FDI imports;
- EVFDI– the volume of FDI export.

The indicator of net investment activity can be either positive or negative. The denominator shows the net investment position, and the numerator shows the investment ability of the country under study. The investment ability depends on the country's economic development, its investment attractiveness, the availability of natural and labor resources, and the stability of its economic and political situation. The sign (-) shows that the outflow of FDI for a given year exceeds the inflow, and vice versa with the sign (+).

For the term, for a more detailed assessment of the investment activity of the studied countries, we will analyze the dynamics of changes in the inflow of foreign direct investment (% of GDP) according to the World Bank data.

VI. Modeling the relationship between indices and factors of technological competitiveness based on correlation and regression analysis.

Correlation analysis is used to determine and study the relationship between the indicators studied and to establish the relative degree of dependence of the performance indicator on each factor.

The primary purpose of multiple regression analysis is to consider the relationships between a dependent variable and several independent variables. It is necessary to analyze the relationship between the resulting variable and the many factors and identify the factors that most influence the outcome. This analysis can predict a finite variable's value depending on certain factors' values.

The forecast linear equation that estimates the multiple regression model that will be used:

$$Y = a + b_1 \times X_1 + b_2 \times X_2 + b_3 \times X_3 + \dots + b_n \times X_n$$
(7)

- Y is the dependent variable, what is being predicted or explained;
- X1; X2; X3; Xn are the independent variables that explain the variance in Y;
- 'a' is the constant or value of a function with zero value of all factors;
- b1; b2; b3; bn are the regression coefficients.

 R_2 will be used to describe the precision of the process model. If the value exceeds 0.7, the model is considered reliable.

Thus, ultimately, we will be able to quantitatively indicate how the value of the index will change when a certain factor changes by one based on the value of the regression coefficient. The result of the study will identify the main ways to increase the level of technological competitiveness in Ukraine.

For correlation analysis, indicators from the Global Innovation Index were selected. According to Hausmann & Klinger, 2006; Hidalgo & Hausmann, 2009 Global Innovation Index includes a sufficient number of sub-indices: 1) Institutions, 2) Human capital and research, 3) Infrastructure, 4) Market sophistication, 5) Business sophistication, 6) Knowledge and technology outputs and 7) Creative outputs. Those sub-indices fully characterize the country's technological readiness, its innovative potential, the degree of educational and institutional potential formation, financing of innovations, innovative infrastructure, and the economic effect of innovations. Therefore, based on the research of Hausmann & Klinger, 2006; Hidalgo & Hausmann, 2009; Sushchenko & Trunina, 2016; Koval et al., 2012, we took one or two variables from each sub-index, based on which we will conduct a correlation analysis and build regression models in order to comprehensively explore the level of technological and innovative development of Ukraine.

RESULTS

In the modern world, the ability of countries to transform existing knowledge into innovation and use it effectively determines the international competitiveness of economies. Therefore, most countries are more eager to open their national economy to foreign countries and integrate it into the world. At this scale, economic growth, development of countries and creation of employment opportunities are related to their ability to innovate and their potential to export these innovations, as countries need to develop, produce, and sell products that have contributed to increased competitiveness state (Levchenko & Britchenko, 2021). Therefore, according to our methodology, first, we will analyze the place of the leading countries and Ukraine in the competitive environment. Then we will consider their foreign trade

in high-tech products and calculate and analyze the necessary indicators to assess the technological development of countries.

The first index we will look at will be the Global Competitiveness Index (GCI). We selected five GCI sub-indices which have the most significant impact on the technological competitiveness of economies. These are Infrastructure, ICT adoption, Business dynamism, and Innovation capability. As shown in Figure 1, the USA (2nd place in GCI, 2019) is a world leader. Even though it has dropped one position in 2018, it remains a center of innovation, ranking 1st in business dynamism and 2nd in innovation capability.

In terms of technology and innovation, Canada's indicators of Technological adoption (70.3, 34th place) and "Innovation capability" (74.0, 16th place) indicate that it is pretty technologically advanced but still far from the leaders. Canada is ranked 14th in GCI. China is ranked 28th overall. China is rapidly increasing its innovative potential (24th place) and improving its technological effectiveness (26th place). It is worth considering that China has a very high rate of technology diffusion, but insufficient education and skills of human capital hinder the country's development (64th place).

France, the United Kingdom, and Germany occupy approximately the same high positions in the ranking. These powerful innovation centers are always included in the top 10 in "Innovation". However, they should accelerate the adoption of ICT, as their pace is not currently enough to catch up with South Korea (1st place) and Japan (3rd place). These five countries also have highly developed infrastructure (5th-11th place). Germany and the UK boast their Skills rankings 5th and 11th, and Business dynamism rankings fifth and ninth respectively.

Ukraine and Russia respectively occupy 85th and 43rd places. In contrast to Ukraine, Russia has a higher technological potential (25th place against 77th) and a more remarkable ability to innovate (32nd place against 60th). However, these countries are improving their "technological" positions every year by improving the quality of their scientific infrastructure and increasing spending on R&D. In terms of the quality of education, the countries occupy quite good positions – 54th (RF) and 44th (Ukraine), but this "quality" does not quite correspond to the needs of the modern economy. Therefore, further improving infrastructure, increasing investment in science, and strengthening cooperation between companies, universities and research centers will improve the competitiveness of countries in the future.

The following world index is the Global Digital Competitiveness Index (Figure 2). This index measures the ability and willingness of countries to research and implement digital technologies to transform economies. Therefore, from Figure 2, we can say that in 2020 the USA was the leader in digitalization, which has not yielded its leadership for the third year in a row. South Korea is also in the top 10 (8th place), Canada is 12th, the United Kingdom is 13th, China is 16th and Germany is 18th. Ukraine is in the top 5 losers in the ranking – 58th out of 62.

According to the "Skills" indicator, the leaders are the USA (1st place), Canada (5th), China (8th) and South Korea (10th). Such results are achieved by forming a single nationwide scientific and innovation-technological space, functioning on the principles of cooperation between the public and private sectors of the national economy. Ukraine ranks 38th for this factor, but it rises every year thanks to the increased number of talents and digital and technological skills development.

The USA (7th), South Korea (12th), Canada (13th) and France (15th) take the competitive places according to the indicator "Technologies". It is due to their scientific and technical concentration – a large percentage of employment in high-tech industries and the widespread use of robots in science and industry. Again, the USA (2nd place) and Korea (3rd place) took the first place for "Future Readiness". Canada, China, and the United Kingdom are in the top 20 countries for this indicator. These results are

INNOVATION AND INVESTMENT MECHANISM

due to the policies of these countries and the implementation of government strategies, the availability of venture capital, adaptive attitudes (transition to digital platforms, the development of e-commerce) and business development (quick response to opportunities and threats). Ukraine (61st place) with the Russian Federation (53rd place) live for today and do not prepare for the future.

The final index is the 2020 Global Innovation Index (Table 1). According to Table 1, the clear leaders of innovative development are the USA (3rd place), the United Kingdom (4th), Germany (9th) and South Korea (10th). High development of human capital and science (1-12th place) and information and communication technologies (1-15th place), a large number of R&D costs (1-9th place), intellectual workers (2-16th place) and the uninterrupted development of technology and science (3-11th places) provide these countries with leading positions in innovative and technological development from year to year. However, we have selected only a few primary indicators that determine the technological competitiveness of economies.

China, Japan, France, and Canada also have top indicators. For example, Canada and Japan are 6th and 8th in the development of institutions, 4th and 9th in the favorable business environment, and 3rd and 9th in the development of the domestic market characterized by favorable lending and availability and sufficient investment. China ranks 1st in the number and quality of work of intellectual workers and 7th in the development of technology and the knowledge economy. However, online creativity ranks as much as 113th because of strict government policy on Internet networks. On the other hand, France has well-developed information and communication technologies (6th place).

Ukraine and Russia respectively occupy 45th and 47th places in the overall rating. The countries have a well-developed human capital and science (39th and 30th places). They are mainly distinguished by the quality of higher education (32nd and 17th places), the presence of qualified intellectual workers (47th and 36th places) and the creation of new knowledge (33rd and 30th places). It is necessary to compare these indices and determine whether the development of innovations and technologies contributes to an increase in countries' technological and global competitiveness (Figure 3).

In general, we see that the indices repeat each other – the more the country's innovative development, the greater the overall competitiveness, and vice versa. WDCI generally also repeats GCI, but in Canada, China, South Korea and the United States, the former's prevalence is visible, indicating that countries are not wholly dependent on digital transformation. So, it can state that the country's development in science, technology and innovation will contribute to an increase in technological and global competitiveness, economic growth of the state and the well-being of the population.

The most developed countries occupy leading positions in exports, including high-tech products, since producing high-tech products means producing products with high added value and hence high export earnings. Therefore, it should be considered the share of the leading countries and Ukraine in the world export of high-tech products (Figure 4). In figure 4 (2020), a quarter of all world exports of high-tech products fall on the People's Republic of China, and together with other leading countries, they form more than half of these exports. It indicates that the export of such products is more characteristic of highly developed countries, given that the contribution of exports from Ukraine and the Russian Federation is so insignificant that it cannot even be seen on the graph next to such powerful countries.

The World Bank annually calculates the volume of high-tech exports in the structure of industrial exports of countries. This indicator demonstrates what kind of return has scientific and innovative developments and what part of the country's income comes from the export of high-tech products. Therefore, we calculated the average for each country in 2013-2020 (Figure 5). The calculation results again confirm that South Korea, China, the USA, France, and the United Kingdom have a high percentage

of high-tech exports, which means they have competitive advantages in the market, which positively affects the country's technological competitiveness.

In addition to commodity exports of high-tech products, it is necessary to study the dynamics of the export of information and communication services from the total export of state services (Figure 6). It should be noted that information and communication technologies (ICT) (2021) include the Internet, wireless networks, telephones, computers, software, video communications, social networks and other multimedia applications and services that allow users to receive, collect, store, transmit and manipulate information in digital form.

In 2013-2020, the export value of ICT services in the studied countries increased by 28% (in 2013 - by 58.53%, in 2020 - by 86.54%). Countries such as Germany, China and Ukraine pay significant attention to these services – in 2020, the export of ICT services in China accounted for 12.66%, Germany – 11.7%, and Ukraine – 19.38%. It confirms their high level of ICT services and the great demand for them in the international arena. In general, among the studied countries, China, France, and the UK are among the ten largest world exporters of ICT services. Japan (2.7%), South Korea (4.79%) and the United States (5.08%) are now slightly behind.

In monetary terms, the export of ICT services in 2020 in Ukraine amounted to2,76billionUS dollars, when in 2013, it was only0.72 a billion US dollars. For example, in China – 26.97 billion US dollars (2020) versus 10.47 billion US dollars in 2013, in the USA – 42.21 billion US dollars (2020) versus 25.30 billion US dollars, in Germany – 37.4 billion US dollars and 2.08 billion US dollars. These countries benefit significantly from the presence of a high concentration of multinationals and the size of their domestic market, helping the countries where they are based on remaining the leading exporters of ICT services.

As for the forecast, we have built a trend analysis for Ukraine, Germany, and Canada. The reliability of the analysis is high, as indicated by the coefficients of determination – 94.7%, 84.7% and 83.79%, respectively. Exports of ICT services in Ukraine and Germany will continue to overgrow until 2022. Referring to the forecast of the IT Ukraine Association, by 2025, the IT market in Ukraine will grow by 22-30% annually, and the number of employees has every chance to double. However, this threatens an "overheated market" when the demand for programmers will be more supply. Ukraine should focus on the development of reliable infrastructure and facilitate the establishment of cooperation between all market actors. As for Canada, the development trend is negative, meaning that entirely different exported services prevail in Canada.

According to our methodology for assessing the technological competitiveness of countries, we will determine the comparative advantages of countries in key industries of high-tech products of the leading countries and Ukraine and investigate the factors of export efficiency of the studied countries.

The first indicator is the ratio of exports of high-tech products to the countries' GDP (Figure 7). According to Figure 7, it can be stated that the export quota of high-tech products of countries is very different. For example, in South Korea, the average export quota for 2013-2020 amounted to 10.07%, indicating a rather significant impact of the export of high-tech goods on the economy's income. Meanwhile, in Ukraine, the USA, Canada, Russia, and Japan, it does not exceed 2.15% (average for 2013-2020), which indicates a rather small impact of the export of these goods on the GDP of these countries and requires more active work on the part of the government by, for example, the development of the processes of re-industrialization and neo-industrialization (Industry 4.0).

Next, it will calculate the indicators of the comparative advantages of the leading countries and Ukraine in high-tech products. The calculation results are shown in Table 2. As we can see from the figure, each country has comparative advantages for different high-tech products. For example, in the

INNOVATION AND INVESTMENT MECHANISM

aerospace industry, countries such as Germany (0.02), the United Kingdom (1.15), South Korea (0.76), Japan (0.54) and Ukraine (3.46) have comparative advantages. For pharmaceutical products, countries such as France (0.32), Germany (0.35) and the United Kingdom (0.03) can be distinguished. Germany (0.44), Great Britain (2.04), China (3.83), and South Korea (1.89) have relative advantages in office equipment, while the United States (0.34) and Germany (0.34) in instrument engineering and for telecommunications equipment only China with an indicator of 3.89. At the same time, countries such as Russia and Canada have only negative indicators, indicating that the advantage of exporting these goods is carried mainly by international partners.

It must be noted that the growth potential of Ukraine in the aerospace industry is associated with the reform of the system and efforts to increase public and private funding for this industry in recent years. However, today there is high competition in this market, which requires Ukraine to an innovative approach to adapting to the conditions of the global competitive market.

The final indicator is R&D expenditures in the GDP of the leading countries and Ukraine (Figure 8). This indicator shows the degree of return on scientific developments and research. According to Figure 8, South Korea spends the most on science and research (the average for 2013-2020 is 4.25% of GDP), Japan (3.26%), Germany (2.91%) and the United States (2.75%). In the post-Soviet countries, Ukraine and Russia, funding is low -0.61% and 1.05%, respectively. In our opinion, countries need to improve the efficiency of their R&D base to remain competitive. It can be done by improving the relationship between science and industry. It is necessary to strengthen ties between universities and research centers, on the one hand, and the industrial sector, on the other.

According to a 2020 report by the World Intellectual Property Organization, the largest share of R&D spending goes to ICT and electronic equipment (23.5%), pharmaceuticals and biotechnology (18.8%), cars (15.6%), software and ICT services (14.4%). Therefore, introducing innovations is essential for countries and large corporations to be competitive in international competition. Thus, it can be stated that countries should develop strategic plans to increase the competitiveness of their economies and promote economic growth and development. It is obliged to introduce advanced technologies in their production, improve conditions for scientists for research and development, highly qualified human resources, develop information and communication infrastructure, a high level of education, cooperation between the state, industry and universities, and large-scale access to the Internet, favorable laws on the protection of intellectual activity and patents, financial, institutional and structural policies of states.

Today, in the context of the fourth industrial revolution, the development of the "new economy" includes such factors of the competitiveness of the country's industry as the rapid development of the knowledge market, the large-scale use of innovative technologies and the significant development of small and medium-sized businesses. The studied countries, in comparison with others, are the world leaders in the export of their products, but the question is whether their national exports are innovative. As we know, exporting high-tech products is one of the main indicators of technological competitiveness. Therefore, the industry's employer of the Sturges formula should determine the degree of innovativeness of the leading countries' and Ukraine's exports in terms of the share of high-tech exports in the countries' total exports.

According to the Sturges formula, we calculate the coefficient k: $k = 1 + 3.322 lg 10 = 1 + 3.322 \times 1 = 4.322$.

The resulting coefficient k indicates that the population of countries is divided into four groups (n). Now let us calculate the value of the number of equal intervals between these groups h:

 $h = (E_{Tmax} - E_{Tmin}) / n = 6.11483$

So, as a result, we get four intervals in the studied set of countries (Table 3).

Thus, according to our calculations, France, China, and South Korea have the highest innovativeness in national exports. In contrast, Ukraine and Russia have the lowest, which indicates the increased importance of medium- and low-tech industries in their export structure compared to other studied countries.

In addition, we will calculate the level of net investment activity of the leading countries and Ukraine as one of the main factors of innovative development. The initial data for the calculation are given in Table 4.

So, we can say that the most investment active states with a positive indicator are the United States (11.17%) and China (26.51%). The United Kingdom (64.24%) and Ukraine (82.31%) are less active but also have positive results. First, this result indicates that FDI inflows to these countries exceed their outflows. At the same time, the lower the value of this indicator, the more FDI exports and imports are at approximately the same level. The potential for attracting FDI exceeds the potential for exports. Low negative levels of the indicator of net investment activity in such countries: Canada (-17.19%), the Russian Federation (-13.22%), Germany (-22.85%), South Korea (-47.52%) and France (-23.67%) is explained by the opposite logic, that is, these countries are highly investment-active, but the outflow of FDI exceeds their inflow, while Japan is the leader among the above countries with an indicator of -77.4%.

These results indicate that most of the studied countries do not have, or have, but have a feeble investment policy strategy that fully considers the interests of investors and would allow both to liberalize their market and protect it effectively. We believe that developing an effective investment plan will become a reinforcing factor in improving the innovation and investment mechanism for the development of any economy.

DISCUSSION

In modern conditions of the robust development of technologies, all the countries face specific problems on the way to creating an effective, innovative mechanism for economic development. One can single out such an obstacle as the financial mechanisms for supporting innovative ideas of small and medium-sized businesses are not relatively well-established. Also, today, the degree of internationalization of R&D is gradually increasing, and the innovative mechanism for developing economies is still national. Because all countries are developing very unevenly, an innovative mechanism must be formed to contain a wide range of practical tools (Tykhonova et al., 2019).

So, in our opinion, the results of our analysis allow us to develop a block system of the necessary measures that will become a powerful, innovative mechanism for ensuring the technological competitiveness of states (Table 5). Therefore, countries require the development of targeted measures that will meet the industrial demand of the countries; close all gaps in the production value chain; expand the scope of independent monitoring and reporting by public authorities.

The impact of the coronavirus pandemic should serve as a factor that will force countries to accelerate the digitalization process, stimulate companies to move to digitized business processes, invest in ICT development, and improve technical knowledge and digital skills. Therefore, we need to include some more recommendations for countries to create an innovative mechanism for increasing technological competitiveness:

1. It should be noted that digital transformation must co-occur with the development of the workforce and the legal framework. As technology advances, economic productivity growth depends on

INNOVATION AND INVESTMENT MECHANISM

the ability of firms and households to seize the opportunities presented by new technologies. At the same time, national legislation should keep pace with the digital world and provide favorable rules for digital business models (e.g., e-commerce, consumer economy, FinTech, etc.) (Momaya, 2014; GCI WEF, 2019).

2. Continue to expand public investment in R&D, encourage the private sector to participate in research and development, and disseminate existing technologies to encourage new firms and increase labor force engagement in tomorrow's markets (IMD World Digital Competitiveness Ranking, 2019).

3. Create new jobs to prepare the state for a broader economic transformation for the "markets of tomorrow". The financing of science and education contributes to the creation of new high-quality jobs. It has been estimated that in OECD countries, five new jobs are created for every 1 million US dollars invested in public R&D, and twice that when investment is channeled into research and development through universities (OECD, 2015). However, governments should prioritize research that aims to invent high-tech goods and services that will catalyze a country's competitiveness.

4. Support the attraction of venture capital or create special innovation funds to finance the business in the early stages, as it is a source of job creation, a generator of innovation and a diffusion of technology.

5. Contribute to increasing the innovative potential of companies in the country. Governments should focus their efforts on creating an enabling environment for introducing greener technologies and developing efficient, socially oriented high-tech goods. It can be achieved through, for example, financial incentives (grants, programs, innovation prizes, etc.) (Global Agenda Council on the Future of Software & Society, 2015).

So, strengthening the capacity of public and private actors responsible for developing and implementing innovative strategies is a prerequisite for a successful technological transformation of the economy. Tasks and roles are distributed among several institutions in such an innovation chain: national innovation agencies, local innovation and technology parks, universities and research institutes, individual companies, and others. Coordination and communication between these stakeholders are crucial to ensuring a shared vision and timely decision-making and planning for the future, which will be fundamental to expanding the pool of potential talent, increasing the ability to meet the needs of society, and reaping the economic benefits of technology and innovation.

The final calculation stage of our research is modeling the relationship between indices and factors of technological competitiveness of Ukraine based on correlation and regression analysis, with the help of which we will determine the degree of influence of some indicators on the indices of competitiveness development, as well as provide recommendations for improving the technological development of Ukraine and develop a specific development plan Industry 4.0 in the country.

Indices reflecting the competitiveness of Ukraine were selected as dependent variables (Y1-Y6), namely: the Global Digital Competitiveness Index (Y2), the Global Competitiveness Index (Y1) and its main indicators: "ICT adoption" (Y4), "Innovation capability" (Y3), "Infrastructure" (Y5) and "Business dynamism" (Y6).

The results of the correlation analysis based on the initial data (Table 6) for the indicated indicators of Ukraine in the period 2014-2019 allow us to select three factors each, with which the correlation coefficient is close or too close, for further regression analysis (Table 7). Note that the correlation coefficient determines the degree of dependence between the variables and takes values from -1 (the variables have a strictly negative correlation with each other) to +1 (which means a strictly positive correlation of the variables). If the coefficient is 0, then there is no correlation between the variables.

Multiple regression analysis was performed based on the factors with the strongest correlation (Table 8). Regression analysis for all selected indices showed that the multiple R is from 0.7685 to 0.9831, and the R2 is from 0.8496 to 0.9665. It means a high degree of dependence on the selected indicators, and the calculated parameters of the model explain the relationship between the studied parameters by 84.9-96.6% (Table 9).

Therefore, based on the data obtained, we will model the change in the values of indicators that determine the technological competitiveness of Ukraine:

 $Y3 = 4.1277 + 5.7735 \times X_1 - 3.1509 \times X_3$

An increase in the number of R&D researchers by 1 million will lead to an increase in the innovation capability index by 5.7735, and an increase in receipts from the use of the intellectual property by 1 million US dollars will reduce the indicator by 3.1509.

 $Y4 = 6.7103 - 0.8650 \times X1 - 6.5699 \times X2 - 0.3826 \times X3$

An increase in the ratio of R&D expenditure to GDP by 1%, the number of PCT patents applications per unit and the indicator of the innovation environment by 1 point will lead to a decrease in technological potential by 0.8650; 6.5699 and 0.3826, respectively. This result indicates that there are other indicators, the dependence on Ukraine's technological development factors, which will be more effective.

 $Y5 = 3.7795 + 0.3567 \times X2$

An increase in the ratio of R&D expenditures to GDP by 1% will be reflected in an infrastructure level increase of 0.3567.

 $Y6 = -9.4172 + 2.7425 \times X2 + 3.8100 \times X3$

An increase in the share of ICT exports from the total export of services by 1% will lead to an increase in the level of business dynamism by 2.7425, and more intensive development of clusters by 1 point will increase it by 3.8100.

Thus, having analyzed the results of calculating the regression, we can state that our assumptions regarding the relationship between the selected values, established when determining the correlation coefficient, were confirmed. Based on the results obtained, we can indicate the following primary tools and approaches to increasing the technological competitiveness of Ukraine:

1. To increase the potential of the domestic innovation sphere, it is necessary to actively support the existing key high-tech industries through state financial support and increase the development of research institutions.

2. It is necessary to promote the creation of joint ventures with foreign manufacturers to establish close cooperation relations between research institutions, domestic enterprises with MNCs and large innovative companies for joint high-tech developments and the creation of regional innovation clusters. Additionally, develop a detailed plan for developing such clusters and encourage businesses to cooperate with the government (Global Agenda Council on the Future of Software & Society, 2015).

3. Form a joint educational and scientific space, continue to create research centers, develop strategies for their improvement and provide them with sufficient funding, and systematically improve the conditions for training specialized personnel.

INNOVATION AND INVESTMENT MECHANISM

4. Develop an innovative infrastructure by creating information centers of an interstate nature, which would monitor and collect information for strategic planning of the activities of innovative companies.

5. Actively attract foreign investment by facilitating market access for investors and easing government regulation, thereby stimulating the creation of small enterprises and subsidiaries of MNCs that will carry out research and development in Ukraine (Economic Recovery Center, 2020).

6. Develop a financial mechanism for the targeted distribution of funds between various types of innovative activities and comprehensive support for high-tech exports through the introduction of government programs that would encourage domestic manufacturers to develop and produce innovative products (facilitated taxation, licensing; co-financing or compensation of part of the costs of patenting products of domestic companies abroad, state insurance of contracts; subsidizing the participation of innovative Ukrainian companies in international conferences and exhibitions, etc.).

7. Increase the export of domestic innovative and high-tech products based on a multi-stage approach starting with the sale of this product on the domestic market and then on the market of the post-Soviet space and neighboring countries, which will become a testing platform for the export of high-tech products and their further sale on the world market.

8. Reform governance and key government institutions, reduce corruption, improve technology and science regulations, restore citizen and business confidence in government, and make other institutional improvements.

9. Develop Industry 4.0 through digital transformation. However, this direction of development today is not a priority for the Ukrainian economy since the country does not have a specific concept of technological development and is not involved in the international environment of high-tech industries (Dutta et al., 2020; Ministry of Digital Transformation of Ukraine, 2022; UIF, 2022; Hi Tech Office Ukraine, 2022).

So, it is necessary to develop a specific plan for the development of Industry 4.0 and the digitalization of the Ukrainian economy, based on the results of the analyzes and general recommendations and approaches to increasing the technological competitiveness of Ukraine (Table 10). It is worth noting the main existing problems of Ukraine, which directly hinder the digital transformation of the country, in order to determine the priority areas of development and to give recommendations on how to solve them.

The war of Russia against Ukraine (since February 24, 2022) by no means stopped the process of digital transformation but, on the contrary, actualized it even more. While key sources of export earnings, such as metallurgy and agriculture, are at high risk, with thousands of businesses shut down by the war and millions of people losing their jobs, Ukraine is benefiting from businesses that continue to operate online.

The export IT industry is the restoration of jobs, domestic demand for goods and services, and volunteer assistance to the army, hospitals, rescuers and others fighting for our freedom on the front lines. These are external (export) receipts to the economy of Ukraine to maintain combat capability and victory (Vlasyuk, 2022).

For the first time in history, people are fighting not only in the physical plane but also digitally. What important did the country do during the war? Ukraine has created a powerful IT army uniting Ukrainian and international IT professionals. Now there are about 300 thousand participants. The country

launched the " ϵ Bopor" service. It is a chatbot that collects information about the movement of Russian soldiers, which allows the Armed Forces of Ukraine to carry out critical military operations.

The country is actively using artificial intelligence to recognize dead Russians for photos; finds new solutions for the operation of essential facilities using Starlink technology. Now Ukraine has more than ten thousand stations distributing satellite Internet. They are used to maintain and restore critical infrastructure. The country has launched the first state crypto fund. It has raised over \$60 million so far. All funds go to military and humanitarian aid (Fedorov, 2022).

It is not only a matter of income and well-being of people but also of geopolitical survival. So, to be ready to continue to resist Russia, Ukraine should focus on the modern processing industry, the growth of its share in the structure of GDP, digitalized education, online services and technology business. If before the war, no policy in the country would stimulate investment in the creation and modernization of new production facilities of modern industrial goods, now the state more than ever supports the introduction of digital technologies, the retraining of people, the creation of new businesses (grants to small businesses to start their own business, IT start-ups, paying people for IT courses, opening IT clusters, etc.).

The key at this stage should be the policy of stimulating structural changes to build a technological economy, particularly constructing a modern, digital processing industry. As a result of this policy, new factories should appear that will process local raw materials and produce finished products with high added value. These enterprises will provide jobs for the able-bodied population and create demand for various specialties of working professions, engineers, technologists, etc. (Vlasyuk, 2022).

Thus, today the state of technological development in Ukraine still leaves much to be desired. In addition, the protracted war of the Russian Federation against Ukraine, economic and political instability, the lack of a specific plan for the development of Industry 4.0, a high level of corruption, low digital competence of the population, problems in institutional reform, the consequences of the coronavirus pandemic, etc. in general, the innovative potential of Ukraine is very constrained (Horobets et al., 2021).

Therefore, only a well-coordinated, constructive, and systemic cooperation of the government, business, experts, and academia can help Ukraine overcome all constraining barriers, thereby accelerating its innovative, digital and technological development.

CONCLUSIONS

It was determined that countries that occupy high positions in the Global Innovation Index and the Digital Competitiveness Index, respectively, occupy leading places in the Global Competitiveness Index. It confirms that the country's development in the field of technology and innovation contributes to an increase in technology and countries' global competitiveness.

Analysis of foreign trade in high-tech products showed that the studied countries occupy 55% of this market. Highly developed countries have 2-4% of GDP of R&D expenditures and a relatively low percentage of exports of ICT services (up to 10%). On the other hand, Ukraine has only 0.6% of GDP spending on science and development, a low ratio of high-tech exports goods in GDP (0.8%). However, the country has a very positive indicator for the export of ICT services -19% due to the strong development of the IT market.

The analysis of comparative advantages showed that for some groups of goods some countries have quite good comparative advantages in the export of aerospace products, the United Kingdom and

Ukraine have relative advantages, in pharmaceuticals – Germany and France, in office equipment – China and South Korea, in instrumentation – the USA and Germany, and for telecommunications equipment – only China.

The countries were grouped according to 4 degrees of innovativeness of the total national export. The highest level is in France, China and South Korea, and the lowest is in Ukraine and the Russian Federation. The calculation of the net investment activity of the countries was carried out, the results of which revealed predominantly positive activity – the inflow of FDI to Ukraine, China, the United Kingdom and the United States exceeds their outflow. In other countries, the situation is the opposite.

An innovative and investment mechanism has been developed to ensure the technological competitiveness of countries, the main points of which include deepening cooperation between universities and industry, between the state and business; improving technology transfer; development of a unified educational strategy for old and new digital specialties; increased foreign and government funding for R&D and innovation platforms; creation of "innovation ecosystems"; increasing labor mobility; improvement of normative acts and state instruments of innovation policy; creation of a network model of clusters, public-private innovation partnerships, foreign direct investment funds, a national agency for innovative development, and the like.

Based on the correlation and regression analysis (the reliability of the analysis was 85-97%), it was proved that the number of patent applications, receipts for the use of intellectual property, the export of high-tech products, the number of R&D expenditures from GDP, the degree of the market capitalization of domestic companies, the number of R&D researchers and the development of an innovative environment.

The main instruments for improving the technological competitiveness of Ukraine have been identified, such as: developing and increasing exports of key high-tech industries through financial support and increasing the development of research institutions; creation of research institutions, information centers, joint ventures with foreign companies and MNCs for joint high-tech developments and the creation of regional innovation clusters; stimulating the attraction of foreign investment by facilitating market access for investors and easing government regulation, and the like.

The authors' plan for the development of Industry 4.0 and the digitalization of the Ukrainian economy has been developed, which includes the development of a state concept of technological development for all levels; development of investment projects in various spheres of life; improvement of legislation on the digitalization of the economy; creation of business accelerators, marketplace, research and analytical center – Digital R&D laboratory; development of its index of technological development of Ukraine; creation of state educational institutions for new specialties; improving the digital skills of citizens; implementation of the project "Innovative industrial clusters 4.0" and others.

The war of Russia against Ukraine did not stop the digital transformation process, but on the contrary, it actualized it even more. Ukraine is now benefiting from businesses that continue to operate online. Thanks to the development of the IT industry, Ukraine is restoring jobs and domestic demand for goods and services, helping the army, hospitals, rescuers and other freedom fighters on the front lines. Ukraine is now very supportive of introducing digital technologies, retraining people, and creating new businesses (grants to small businesses to start their own business, IT startups, paying people for IT courses, opening IT clusters, etc.).

We believe that the study's main limitation is that the official statistics of any country do not calculate the size of the digital economy, innovation, and technological potential, making it difficult to

track progress towards digitalization and technological transformation. To date, it is calculated only in a narrow sense (export of high-tech goods, information services, etc.).

Considering the essence of the digital economy, through technologies that affect almost any industry in different ways (the concept of "digital vortex", IMD), it is currently impossible to accurately calculate macroeconomic indicators of influence. However, research in this direction continues (World Bank, for example).

Industry 4.0 stands apart, which is a subjective part of the technological development of countries. As for it, it is possible to determine its state of development (the volume of exports of equipment and technologies, the number of employees in the technological field, investments in research and development). However, such data today only partially make it possible to determine the actual state of development of the digital economy in the sense of "digitized" sectors and industries.

In our study, we relied on statistical analysis data, which allowed us to comprehensively analyze Ukraine's technological competitiveness and the leading countries in the digital technologies and innovations field. Therefore, in this article, we published only the results of the first stage of the study based on statistical analysis. In further research on this topic, we plan to use panel data as soon as they are fully published for our selected coefficients.

Therefore, in conclusion, we believe that our analysis opens several avenues for further research. First, we have offered some background information about countries' competitive technological moves, and we need to understand better how such moves happen. Future research should focus in more detail on digitalization, digitalization indexes (NRI, EGDI, IDI, KEI), cybersecurity (GCI), etc., because as digitalization spreads more and more across industries, the relative importance of the factors we studied may change, leading to even more frequent competitive movements in the markets.

Secondly, it will be necessary to study the consequences of the war in Ukraine in more detail. For now, it is only possible to guess how much damage the technology and innovation sector will suffer. Future research should determine in more detail the extent of war-related impacts and possible ways to mitigate those impacts. Closely related to this issue is how Ukrainian companies are adjusting their business model in war and post-war conditions, trying to move to the most civilized and mobile business model that combines the advantages of the network, innovative business processes, and technologies.

Acknowledgments

The paper is supported by the International Economic Relations Department of Artur Golikov, V.N. Karazin Kharkiv National University.

REFERENCES

- Alekseev, A. (2014). The new industrialization. *Problems of Economic Transition*, 56(12), 43-62. DOI: 10.2753/PET1061-1991561204.
- América, J., & Zamora-Torres, I. (2014). Countries' competitiveness on innovation and technology. *Global Journal of Business Research*, 5, 73-83.
- Balcerzak, A.P. (2015). Europe 2020 strategy and structural diversity between old and new member states. Application of zero-unitarization method for dynamic analysis in the years 2004-2013. *Economics & Sociology*, 8(2), 190-210. DOI: 10.14254/2071-789X.2015/8-2/14.
- Barca, F., McCann, P., & Rodríguez–Pose, A. (2012). The case for regional development intervention: place-based versus place-neutral approaches. *Journal of Regional Science*, 52(1), 134-152. DOI: 10.1111/j.1467-9787.2011.00756.x.

- Becker, S.O., Egger, P.H., & von Ehrlich, M. (2012). Too much of a good thing? On the growth effects of the EU's regional policy. *European Economic Review*, 56(4), 648-668. DOI: 10.1016/j.euroecorev.2012.03.001.
- Bogomazova, V.M. (2003). Methods of forecasting indicators of foreign economic activity. Kyiv: Nauka.

Cassidy, M. (2007) Ireland's competitiveness performance. *Quarterly Bulletin*, 2, 93-127.

Dutta, S., Lanvin, B., & Wunsch-Vincent, S. (2020). Global Innovation Index. Retrieved from https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf

Economic Recovery Center. (2020). Retrieved from https://recovery.org.ua/

Fagerberg, J. (1988). International competitiveness. The Economic Journal, 98(391), 355-374.

- Fedorov M. (2022) Digitization of Ukraine: before, during and after full-scale war. Ukrainian truth, 2022. Retrieved from https://www.pravda.com.ua/columns/2022/05/27/7348844/.
- Fedulova, L.I. (2008). Technological modernization of Ukrainian industry. Kyiv: Chetverta khvylia.
- Global Agenda Council on the Future of Software & Society. (2015). Deep shift technology tipping points and societal impact. Retrieved from https://www3.weforum.org/docs/WEF GAC15 Technological Tipping Points report 2015.pdf
- Gorzhi M. A. (2017) Methodology for assessing the investment activity of a country. *Economics and economic sciences*, 75, 360-363.
- Government services online. Retrieved from https://diia.gov.ua/
- Hausmann, R., & Klinger, B. (2006). Structural Transformation and Patterns of Comparative Advantage in the Product Space. John F. Kennedy School of Government, Harvard University. Retrieved from https://growthlab.cid.harvard.edu/files/growthlab/files/128.pdf
- Hi Tech Office Ukraine. (2022). Retrieved from https://pkiforum.org.ua/organizers/hi-tech-office-ukraine/
- Hidalgo, C.A., & Hausmann, R. (2009). The building blocks of economic complexity. PNAS, 106(26), 10570-10575.
- Holroyd, C. (2007) Science and technology policies, national competitiveness, and the innovation divide. Working Paper No. 32. Waterloo: The Centre for International Governance Innovation
- Horobets, N., Lytvyn, N., Starynskyi, M., Karpushova, E., & Kamenska, N. (2021). Settlement of administrative disputes with the participation of a judge: Foreign experience and implementation in Ukraine. *Journal of Legal, Ethical and Regulatory Issues, 24*(1), 1-7.
- Howells, J., & Michie, J. (1998). Technological competitiveness in an international arena. *International Journal of the Economics of Business*, 5(3), 279-293. DOI: 10.1080/13571519884396
- IMD World Digital Competitiveness Ranking. (2019). Retrieved from <u>https://www.imd.org/research-knowledge/reports/imd-world-digital-competitiveness-ranking-2019/#:~:text=Now%20in%20its%20third%20year,business%2C%20government%20and%20wide r%20society.</u>
- Information and Communication Technologies (ICT). (2021). FAO. Retrieved from http://aims.fao.org/information-and-communication-technologies-ict.
- Johnson, D.M., Porter, A.L., Roessner, J.D., Newman, N.C., & Jin, X.-Y. (2010). High-tech indicators: assessing the competitiveness of selected European countries. *Technology Analysis and Strategic Management*, 22(3), 277-296. DOI: 10.1080/09537321003647313
- Kagermann, H., Wahlster, W., & Helbig, J. (2013). Securing the future of German manufacturing industry. Recommendations for implementing the strategic initiative INDUSTRIE 4.0. Final report. The Industrie 4.0 Working Group;
- Kireiev, A.P. (2001). International Macroeconomics: an open economy and macroeconomic programming. Moscow: International relations.
- Koval, V., Duginets, G., Plekhanova, O., Antonov, A., & Petrova, M. (2019). On the supranational and national level of global value chain management. *Entrepreneurship and Sustainability Issues*, 6(4), 1922-1937. https://doi.org/10.9770/jesi.2019.6.4(27)
- Krupskyi, O. P., Dzhusov, O., Meshko, N., Britchenko, I., & Prytykin, A. (2019). Key sources when formulating competitive advantages for hotel chains. *Tourism*, 67(1), 34-46.
- Levchenko, I., & Britchenko, I. (2021). Estimation of state financial support for non-priority territorial units using the example of bridge construction. *Eastern-European Journal of Enterprise Technologies*, 1, 26-34. DOI:10.15587/1729-4061.2021.225524
- Matyushenko, I. Yu. (2016). Technological competitiveness of Ukraine under conditions of a new industrial revolution and development of convergent technologies. *The Problems of Economy*, 1, 108-120.
- Matyushenko, I. Yu. (2017a). Prospects of development of converging technologies in countries of the World and Ukraine for solving global problem. Kharkiv: Sole Proprietor L. M. Liburkina.
- Matyushenko, I., Khaustova, V., & Knjazev, S. (2017b). Institutional support of innovative R&D in the formation of single research area in the EU and Ukraine. *Nauka and Innovations*, *13*(2), 5-23. DOI: 10.15407/scine13.02.005
- Ministry of Digital Transformation of Ukraine. (2022). Retrieved from https://thedigital.gov.ua/
- Momaya, K. (2001). *International competitiveness: evaluation and enhancement*. New Delhi: Hindustan Publishing.
- Momaya, K. (2014). Technology Management and Competitiveness: Exploratory Case of a Renewable Energy Firm from India (January 18, 2014). DOI: 10.2139/ssrn.2381111
- OECD. (2015). Enabling the next production revolution: issues paper. Retrieved from https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/IND(2015)2&doc Language=En
- Polishchuk, Y., Ivashchenko, A., Britchenko, I., Machashchik, P., & Shkarlet, S. (2019). European smart specialization for Ukrainian regional development: Path from creation to implementation. *Problems* and Perspectives in Management, 17(2), 376-391. DOI:10.21511/ppm.17(2).2019.29
- Porter, A.L., Roessner, J.D., Newman, N.C., & Cauffiel, D. (2014). Indicators of high technology competitiveness of 28 countries. *International Journal of Technology Management*, 12(1), 1-32.
- Priede, Q. J., & Pereira, E.T. (2013). Innovation as a key factor in the international competitiveness of the European Union. *European Integration Studies*, 7, 212-221.
- Prokopenko, O., Holmberg, V., & Omelyanenko, V. (2018). Information and communication technologies support for the participation of universities in innovation networks (comparative study). *Innovative Marketing*, 14(3), 17-29. DOI: 10.21511/im.14(3).2018.03
- Prokopenko, O., Slatvinskyi, M., Bikoshkurska, N., Biloshkurskyi, M., & Omelyanenko, V. (2019). Methodology of national investment and innovation security analytics. *Problems and Perspectives* in Management, 17(1), 380-394. DOI: 10.21511/ppm.17(1).2019.33
- Prokopenko, O.V., & Kasyanenko, T.V. (2013). Complex approach to scientific grounding at selecting the direction (variant) of eco-aimed innovative development at different levels of management. *Actual Problems of Economics*, 139(1), 98-105.
- Radivojevic, V., Krstić, B., & Stanišić, T. (2018). The role of technological readiness in the global competitiveness of Serbian economy. *Facta Universitatis Series: Economics and Organization*, 15, 111-123.

- Schwab, K. (2016). The fourth industrial revolution. World Economic Forum.
- Schwab, K., Zahidi, S., World Economic Forum. (2020). *The global competitiveness report special edition 2020: How countries are performing on the road to recovery*. Retrieved from http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2020.pdf
- Sener, S., & Saridogan, E. (2011). The effects of science-technology-innovation on competitiveness and economic growth. *Procedia Social and Behavioral Sciences*, 24, 815-828.
- Sturges, H.A. (2012). The choice of a class-interva. Journal of the American Association, 21(153), 65-66.
- Sushchenko, O., & Trunina, I. (2016). Creation of innovation clusters as a line of enterprise competitiveness improvement in the field of foreign economic activity. *Actual Problems of Economics*, 177(3), 191-198.
- The future of manufacturing: Driving capabilities, enabling investments. Global Agenda Council on the
Future of Manufacturing. (2014).UNIDO.Retrieved from

Ross, A. (2016). The industries of the future. New York: Simon & Schuster.

http://www3.weforum.org/docs/Media/GAC14/Future_of_Manufacturinggg_Driving_Capabilities.pdf

- The Global Competitiveness Report 2012-2013. (2013). World Economic Forum. Retrieved from http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2012-13.pdf
- The Global Competitiveness Report 2013-2014. (2014). World Economic Forum. Retrieved from http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2013-14.pdf
- The Global Competitiveness Report 2014-2015. (2015). World Economic Forum. Retrieved from http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf
- The Global Competitiveness Report 2015-2016. (2016). World Economic Forum. Retrieved from http://www3.weforum.org/docs/gcr/2015-2016/Global_Competitiveness_Report_2015-2016.pdf
- The Global Competitiveness Report 2016-2017. (2017). World Economic Forum. Retrieved from <u>http://www3.weforum.org/docs/GCR2016-</u> 2017/05FullReport/TheGlobalCompetitivenessReport2016-2017 FINAL.pdf

The Global Competitiveness Report 2017-2018. (2018). World Economic Forum. Retrieved from http://www3.weforum.org/docs/GCR2017-

2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf

- The Global Competitiveness Report 2019. (2019). World Economic Forum. Retrieved from http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf
- Tykhonova, O., Lytvyn, N., Ivantsov, V., Chyshko, K., & Yarosh, A. (2019). Electronic banking as a prospective directive for the financial services market development. *Journal of Legal, Ethical and Regulatory Issues*, 22(Special Issue 2).
- Ukrainian Institute for the Future (UIF). (2022). Retrieved from https://uifuture.org/

UN Comtrade. (2020). Retrieved from https://comtrade.un.org/

- Vlasyuk V. How not to repeat the mistakes of the past and build a technological, competitive economy? *Economic Truth*, 2022. Retrieved from <u>https://www.epravda.com.ua/columns/2022/05/17/687120/</u>.
- Melnik, T. M. (2008). Export potential of Ukraine: methodology for evaluation and analysis. *International Economic Policy*, 1-2, 241-271.



Figure 1. Rating of the leading countries and Ukraine by sub-indices (GCI) that affect the technological

competitiveness of economies, 2019

Source: compiled by the authors based on the Global Competitiveness Report 2019 (2019)



Index, 2020

Source: compiled by the authors based on Global Digital Competitiveness Index (2020)

APPENDIX



Figure 3. Comparison of values of world indices of technological and global competitiveness, 2019-2020 Source: compiled by the authors based on the Global Competitiveness Report 2019 (2019), Global



Innovation Index (Dutta et al., 2020), IMD World Digital Competitiveness Ranking (2019).



Source: compiled by the authors based on World Bank Data (2020)



Figure 5. The average annual ratio of high-tech exports in the structure of industrial exports of the leading countries and Ukraine for 2013-2020, %





Figure 6. Dynamics of ICT services export of the leading countries and Ukraine for 2013-2020, % of export of services

Source: compiled by the authors based on World Bank Data (2020)



Figure 7. Dynamics of changes in the ratio of high-tech export to GDP of the leading countries and Ukraine for 2013-2020, %

Source: compiled and calculated by the authors based on World Bank Data (2020)



Figure 8. Dynamics of the ratio of expenditures on research and development in the GDP of the leading countries and Ukraine in 2013-2020, % of GDP

Source: compiled and calculated by the authors based on World Bank Data (2020)

1. Ranng of the leading	ig coun	unes an	u Okia	me by		Juar IIII	lovatio	II IIIuca	Dutta	ci ai.,
ISO Code of countries	CAN	CHN	FRA	DEU	JPN	KOR	RUS	UKR	GBR	US
Rank	17	14	12	9	16	10	47	45	4	3
INSTITUTIONS	6	62	19	18	8	29	71	93	16	9
Political environment	12	47	20	14	11	24	75	105	25	16
Business environment	4	39	22	14	9	10	45	104	12	2
HUMAN CAPITAL & RESEARCH	19	21	13	5	24	1	30	39	10	12
Education	31	83	24	6	99	16	17	32	15	45
Research & development	18	16	12	7	5	1	33	44	9	2
INFRASTRUCTURE	29	36	16	12	8	14	60	94	6	24
Information & communication technologies	22	45	6	15	10	2	29	82	1	9
MARKET SOPHISTICATION	3	19	18	24	9	11	55	99	5	2
Credit	4	25	42	29	12	10	50	86	8	1
Investment	6	66	27	75	56	42	106	121	5	13
BUSINESS SOPHISTICATION	20	15	21	12	10	7	42	54	19	5
Knowledge workers	28	1	14	11	10	2	36	47	16	5
KNOWLEDGE & TECHNOLOGY OUTPUTS	21	7	16	10	13	11	50	25	9	3
Knowledge creation	14	4	18	5	11	7	30	23	6	3
Knowledge diffusion	33	21	13	17	12	15	66	32	11	16
CREATIVE OUTPUTS	17	12	13	9	24	14	60	44	5	11
Creative goods and services	39	12	31	33	27	19	81	95	10	7
Online creativity	17	113	25	11	48	37	44	39	10	18

Table 1. Rating of the leading countries and Ukraine by the Global Innovation Index (Dutta el al., 2020)

Source: compiled by the authors based on Global Innovation Index (Dutta el al., 2020)

Table 2. Coefficients of comparative advantages of the leading countries and Ukraine in the sectors of high-tech products, average for 2013-2020

Country	Aerospace	Pharmaceuti- cal products	Office equipment	Instrumen- tation	Telecommunica- tion equipment
United States	-0.96	-0.661	-1.153	0.33	-1.467
Canada	-0.293	-0.396	-1.318	-0.906	-2.024
France	-0.63	0.326	-1.007	-0.326	-1.777

INNOVATION AND INVESTMENT MECHANISM

Germany	0.02	0.352	0.448	0.357	-1.334
United Kingdom	1.15	0.032	2.042	-0.425	-1.695
Russian Federation	-0.227	-2.822	-3.916	-3.398	-1.205
China	-0.361	-1.239	3.833	-0.353	3.894
Korea, Rep.	0.76	-0.746	1.891	-0.239	-0.099
Japan	0.542	-1.578	-0.564	-0.243	-0.908
Ukraine	3.468	-2.033	-3.018	-3.252	-1.994

Source: compiled and calculated by the authors based on World Bank Data (2020) and UN Comtrade (2020)

Range	Interval	Export innovativeness	Number of countries	Countries
1	25.2859 – 31.4008	Very high	3	France, China, South Korea
2	19.1711 – 25.2859	High	2	USA, UK
3	13.0563 – 19.1711	Middle	3	Canada, Germany, Japan
4	6.9414 - 13.0563	Low	2	Russia, Ukraine

Source: compiled and calculated by the authors

Table 4. The level of the country's net investment activity of the leading countries and Ukraine for 2013-2020 pp., %

Country	IV _{FDI} (average indicator for 2013-2020), billion US dollars	EV _{FDI} (average indicator for 2013-2020), billion US dollars	NIA, %
United States	344.52	275.25	11.17
Canada	48.53	68.7	-17.19
France	38.05	61.67	-23.67
Germany	79.7	126.92	-22.85
United Kingdom	55.87	12.16	64.24
Russian Federation	31.31	40.85	-13.22
China	221.83	128.86	26.51
Korea, Rep.	11.03	31.03	-47.52
Japan	20.91	164.21	-77.4
Ukraine	4.01	0.39	82.31

Source: compiled and calculated by the authors based on World Bank Data (2020)

Table 5. Block system of the necessary measures as an innovation and investment mechanism for ensuring the technological competitiveness of economies

Priority	Mechanism									
	Strengthening and deepening cooperation between universities and industrial enterprises for									
	sustainable development and the creation of new technological developments.									
	Development of education and creation of a unified strategy in the field of training highly qualified									
First level	specialists for new fields of activity.									
events	Improving technology transfer to commercialize research and development results.									
	To establish a close relationship between government and business to effectively collaborate on									
	Increases the flow of investment in the development of innovative products and services.									
	investment climate in countries.									
	Creation of a network model of clusters for close permanent cooperation at all stages of research,									
	exchange of results and development of new high-tech products.									
	To develop projects of favorable regulatory legal documents of economic policy, which contributed									
Second	to an increase in demand and supply for innovative goods.									
level events	Focus on attracting additional investment in R&D.									
	Introduce widespread use of a package of innovation policy instruments (for example, credit guarantees, tax credits), create foreign direct investment funds, attract venture capital, and more.									
Third level	It is necessary to increase the mobility of the labor force, otherwise it will become one of the obstacles to increasing competitiveness in the field of technology and innovation.									
events	Create of "innovation ecosystems" – mechanisms that would simplify and, at the same time, deepen cooperation between countries, TNCs, organizations, enterprises that are part of the chain of production and sale of the latest goods and services.									
	Creation of a joint public-private innovative partnership to meet government demand for innovative products by attracting innovative small and medium-sized businesses.									
Fourth level events	It is necessary to achieve effective coordination of innovative mechanisms between supranational and national governments to create the only mechanism that will work in the long term, which will contribute to stable economic growth.									
	Creation of a national agency for innovative development of the state, with the aim of developing a mechanism for expert consultation to identify needs in time and make appropriate decisions to meet them.									
0 14										

Source: Momaya (2014); the Global Competitiveness Report 2019 (2019); Matyushenko (2016; 2017a); Global Innovation Index (Dutta el al., 2020); Koval et al. (2019); IMD World Digital Competitiveness Ranking (2019); Ministry of Digital Transformation of Ukraine (2022); Economic Recovery Center (2020).

Table 6. Source data for correlation between o	development factors	and indices that	determine global	and
technological competitiveness of Uk	raine			

X-factors	2014	2015	2016	2017	2018	2019
Ratio of high-tech products export to industrial exports, %	6.85	7.69	8.74	7.40	6.43	5.57
Ratio of R&D expenditures to GDP,%	0.76	0.65	0.61	0.48	0.44	0.47
R&D researchers	1162	1025	1006	1037	994	988
PCT patents applications/million pop.	5412	4813	4497	4095	4047	396
ICT services exports, % of total exports of services	0.927	0.959	0.824	0.946	0.931	0.984
Market capitalization of domestic companies (% of GDP)	2.746	3.193	3.746	4.65	4.63	3.37
Income from the intellectual property use, million US dollars	1072	552	358	358	430	592
FDI inflows (% of GDP)	2.459	0.634	-0.405	4.249	3.492	3.495
State of cluster development	2.85	2.87	2.99	2.95	2.95	3.13
Innovative environment	6.3	6.2	6.3	6.0	6.0	6.0

INNOVATION AND INVESTMENT MECHANISM

Venture capital (%	of GDP)		0.023	0.015	0.012	0.014	0.018	0.018
	Global Competitiveness Index	IMD World Digital Competitiveness Index	Innovation capability (GCI)		ICI adoption (UCI)	Infrastructure (GCI)		Business dynamism (GCI)
	У1	У2	У3		y4	У5		У6
2014	4.050	54	3	3	.28	4.1		3.7
2015	4.140	50	3.2		3.5	4.07		3.68
2016	4.030	59	3.4	3	.45	4.16		3.66
2017	4.000	59	3.4	3	.58	4.07		3.67
2018	4.110	60	3.4		3.8	3.93		3.62
2019	4.010	58.00	3.37	3	.84	3.95		4.95

Source: The Global Competitiveness Reports (2011-2019), Global Innovation Index (2011-2019), IMD World Digital Competitiveness Ranking (2011-2019)

 Table 7. Correlation coefficient between indices and factors, the relationship of which was most pronounced

Index / Indicator	Factor	Correlation coefficient value
Global Competitiveness	PCT patents applications/million pop.	0.2756
Index (Y1)	FDI inflows (% of GDP)	-0.3296
	State of cluster development	-0.5472
IMD World Digital	Ratio of R&D expenditures to GDP,%	-0.6970
Competitiveness Index (X2)	PCT patents applications/million pop.	-0.7054
(12)	Market capitalization of domestic companies (% of GDP)	0.7204
Innovation capability(Y3)	R&D researchers	-0.8848
	PCT patents applications/million pop.	-0.9307
	Income from the intellectual property use, million US dollars	-0.9237
ICT adoption(Y4)	Ratio of R&D expenditures to GDP, %	-0.9180
	PCT patents applications/million pop.	-0.8933
	Innovative environment	-0.8749
Infrastructure(Y5)	Ratio of high-tech products export to industrial exports, %	0.8599
	Ratio of R&D expenditures to GDP, %	0.7018
	Innovative environment	0.8146
Business dynamism(Y6)	Ratio of high-tech products export to industrial exports, %	-0.6825
	ICT services exports, % of total exports of services	0.5015
	State of cluster development	0.8288

Source: compiled by the authors

	Global Competiti veness Index	IMD World Digital Competitiveness Index	Innovation capability (GCI)	ICT adoption (GCI)	Infrastructure (GCI)	Business dynamism (GCI)
Ratio of high-tech products export to industrial exports, %	0.0816	-0.1395	0.0427	-0.6225	0.8599	-0.6825
Ratio of R&D expenditures to GDP,%	0.2066	-0.6970	-0.8700	-0.9180	0.7018	-0.3562
R&D researchers	-0.0610	-0.4186	-0.8848	-0.7881	0.4360	-0.3194
PCT patents applications/million pop.	0.2756	-0.7054	-0.9307	-0.8933	0.6009	-0.4019
ICT services exports, % of total exports of services	0.1205	-0.2936	-0.1527	0.4555	-0.6734	0.5015
Market capitalization of domestic companies (% of GDP)	-0.1191	0.7204	0.7918	0.5274	-0.3221	-0.2586
Income from the intellectual property use, million US dollars	0.0569	-0.5067	-0.9237	-0.5104	0.0966	0.0911
FDI inflows (% of GDP)	-0.3296	0.4074	0.1640	0.5156	-0.6691	0.3037
State of cluster development	-0.5472	0.5831	0.6667	0.7295	-0.4496	0.8288
Innovative environment	0.1568	-0.4905	-0.6149	-0.8749	0.8146	-0.4049
Venture capital (% of GDP)	0.1051	-0.2398	-0.7138	-0.1328	-0.3245	0.1918

Table 8. Correlation between factors of development and indices that determine the global and technological competitiveness of Ukraine

Source: compiled and calculated by the authors based on Table 6.

Table 9. Results of multiple regression analysis between factors of development and indices	S
that determine the global and technological competitiveness of Ukraine	

	0					
	Global Competitiveness Index	IMD World Digital Competitiveness Index	Innovation capability (GCI)	ICT adoption (GCI)	Infrastructure (GCI)	Business dynamism (GCI)
	Y1	Y2	Y3	Y4	Y5	Y6
Multiple R	0.6650	0.7685	0.9831	0.9222	0.9421	0.9217
\mathbb{R}^2	0.4423	0.5907	0.9665	0.8504	0.8876	0.8496
F	0.5287	0.9622	19.2559	3.7924	5.2664	3.7660
Significance F	0.7058	0.5459	0.0497	0.2156	0.1637	0.2168
Y	5.7530	64.8760	4.1277	6.7103	3.7795	-9.4172
X1	-5.3511	19.5120	5.7735	-0.8650	0.0586	-0.0724
X2	-0.0111	-0.0064	-0.0001	-6.5699	0.3567	2.7425
X3	-0.4840	2.5380	-3.1509	-0.3826	-0.0577	3.8100

Source: compiled and calculated by the authors based on Table 10

INNOVATION AND INVESTMENT MECHANISM

economy	
Problem	Recommendations for solving a problem
1	2
There is no vision of a strategy for the development of a technological economy	1. Develop a nationwide concept of technological development of Ukraine for the national (economy), state (government), professional and expert (clusters, associations), corporate (business), civil levels with clear objectives and assessment indicators.
Lack of public investment and foreign investment in the technological sector of the economy	 Create investment projects in all spheres of life (education, transport, medicine, ecology, security, tourism, etc.), attracting FDI, private local investment and receiving structured loans from, for example, the European Investment Bank. Develop a project "Investment conveyor" for BOT projects (partnership between government and business).
Lack of own system for assessing indicators of technological development in Ukraine	1. Develop its own index of technological development of Ukraine to avoid differences in the data obtained from various regulators, since this distorts Ukraine's place and rating in global indices.
Weak level of digital transformation of the economy	 Eliminate institutional and legislative obstacles that hinder the development of the digital economy. Decide on digitalization projects at the national level. Assess the economic effects of their implementation and, based on this, develop financing plans for the next pool of digital projects. Create a scientific and analytical center in the form of a Digital R&D laboratory, which would analyze innovative ideas and would become a platform for testing them. Expand the broadband Internet system (3G, 4G, 5G) to attract businesses to e- commerce.
The education system does not meet the real needs of the market	 Make educational institutions active subjects of digitalization. Create 4 state educational institutions of higher education (Kyiv, Lviv, Odessa and Kharkiv) in such specialties as "Big Data", "Smart Infrastructure" and "Artificial Intelligence". Acquire practical skills, create business accelerators, government marketplaces, industrial testbeds, and more.
Weak development of digital platforms	1. Systematically stimulate the economy and business to use digital platforms (e- commerce, FinTech, blockchain, smart logistics), as well as platforms for the provision of electronic services (education, transport, ecology, medicine, etc.).
Underdeveloped high-tech industry	 Create regional centers "Industry 4.0" in all economic regions of Ukraine. Implement the project "Innovative industrial clusters 4.0", based on the experience of already existing successful clusters in Kyiv, Kharkiv, Mykolaiv and Vinnytsa. Develop a sectoral roadmap for the transformation of key "breakthrough" high-tech sectors of the Ukrainian economy.
Low digital competence of Ukrainian citizens	1. Develop tools to improve the digital skills of citizens, provide business access to the retraining market for workers, and stimulate the development of non-formal education

Table 10. The authors' plan for the development of Industry 4.0 and digitalization of the Ukrainian economy

Source: Ministry of Digital Transformation of Ukraine (2022); Economic Recovery Center (2020); UIF (2022); Hi Tech Office Ukraine (2022).

.

DETERMINANTS OF FINTECH SERVICE CONTINUANCE BEHAVIOR: MODERATING ROLE OF TRANSACTION SECURITY AND TRUST

Dewan Mehrab Ashrafi, Rabiul Hossain Dovash and Mohammad Rokibul Kabir

Received July 24th, 2022; Revised September 22nd, 2022; Accepted October 4th, 2022

ABSTRACT

This study aims to examine the behavioral intentions for using fintech based applications from the lens of Information technology quality and trust-based model. Data were collected from 275 respondents through an online questionnaire by using the purposive sampling method. PLS-SEM was performed to test the impact of trust and risk on fintech continuance intention, and results showed that trust impacted continuance more than perceived risk. Moreover, information, service and system quality significantly impacted trust and perceived risk. The study also highlighted perceived risk and trust as mediators, and results showed that trust partially mediated the relationship between system, information, service quality and fintech continuance intention. Contrarily, perceived risk mediated the relationships between service and system quality and fintech continuance intention. This study enhances the theoretical depth and adds to the existing literature by presenting transaction security and trust as moderators. Results suggested that transaction security moderated the association between trust and fintech continuance intention. Additionally, trust showed to have a moderating impact on the relationship between perceived risk and fintech continuance intention. The study adds to the body of knowledge by emphasizing the role of trust and perceived risk as antecedents of behavioral intention to use fintech-based services. The study provides novel and meaningful insights and guidance for banks, fintech service providers, and policymakers to achieve a desirable position in the users' minds and design better experiences for customers by making the platform more innovative, reliable, and trustworthy.

Keywords: Fintech, Behavioral intention, Perceived risk, Trust, Blockchain, Transaction security.

Dewan Mehrab Ashrafi (Corresponding Author) is working as a Senior Lecturer at University of Liberal Arts Bangladesh (ULAB). His academic credentials include a Master of Science in International Management and Psychology from Rhein-Waal University, Germany. He also earned his bachelor's degree in Marketing from East West University, Bangladesh. His research focus is on consumer behavior, business psychology, and innovation adoption.

Rabiul Hossain Dovash is an Assistant Professor at East Delta University. He earned his degree of Master of Management in Logistics and Supply Chain Management at University of Windsor, Canada. Previously, he also had obtained MBA at North South University, Bangladesh and BBA at University of Madras, India. His research focus is on the field of Supply Chain Management; around Logistics, Supply Chain Planning, Bullwhip Effect, Manufacturing, Lean Six Sigma, and Maritime & Aviation Logistics.

Mohammad Rokibul Kabir is Associate Dean of the School of Business Administration of East Delta University, Bangladesh. *Kabir* obtained BBA and MBA in AIS, MPhil in Financial Disclosures and PhD in Management Accounting Practices in the Manufacturing Industries of Bangladesh from University of Chittagong. He did his post-Doctoral research on Blockchain Use Behaviour from Universiti Malaysia Perlis (UNIMAP). Kabir completed MDP in Business Analytics from Indian Institute of Management Calcutta (IIMC). He has also obtained LLB from UITS. He has more than fifty research publications and he is highly interested in Education, Accounting, Finance, and Business Technology related research.

INTRODUCTION

Traditional financial transactions are no longer the same as before, day-by-day it's getting revolutionized by Fintech (Kaur et al., 2021). Fintech is significantly advancing traditional financial structures through major innovations that are providing a sustainable ecosystem for new and diverse financial businesses (Deng & Cheng, 2019; Zavolokina et al., 2016). That's why Fintech is fundamentally considered disruptive (Piccolo et al., 2022). New financial industries that have unique characteristics from the conventional ones can utilize it as an accelerator to sustain their economic growth. High expectations of Fintech growth have substantially increased Fintech investments worldwide. According to the reports of KPMG (KPMG, 2019), global investments have increased dramatically from US\$18.9 billion to US\$111.8 billion in Fintech during 2013-18, which is nearly six-fold. Even though financial customers have started to adopt and use Fintech in their operations, Fintech's anticipated growth has not been achieved in the real scenario. Like both sides of a coin, Fintech is both innovative and unpredictable. This reverse nature of Fintech is affecting its growth because potential customers are not confident enough to adopt Fintech. It was quite challenging for Fintech providers to maintain customers and encourage them to post-adoption use of Fintech. Nevertheless, an in-depth analysis of the intentional continuance of Fintech is required in order to achieve as well as sustain its anticipated growth. The research focuses on two critical factors while examining the behavior of continuous use in Fintech's context: Uncertainty and the IT (Information Technology) quality. Because Fintech is less predictable in nature, the uncertainty factor is more critical in Fintech when compared to typical e-banking transactions. Uncertainty mostly exists because there are no central authorities involved to supervise Fintech. Opportunistic behavior of the Fintech providers along with the deficiency of safety nets, specific regulations for different regions, frauds, hacks, and illegal use, all can lead to financial losses as well as social damage (Cortina & Schmukler, 2018; Ryu, 2018; Sobehart, 2016). The confusion, therefore, makes consumers reluctant to embrace and use Fintech which consequently impacts the pace and reach of Fintech's move towards sustainable growth. By building more confidence and fewer potential uncertainties, meeting the needs of consumers, and preserving their loyalty, uncertainty can be minimized both effectively and efficiently (Namahoot & Laohavichien, 2018; Nicolaou & McKnight, 2006; Song, 2010). Previous research has typically investigated the uncertainty in mobile and online purchases through positioning the perceived risk and trust (Namahoot & Laohavichien, 2018; Nicolaou & McKnight, 2006; Song, 2010). Therefore, perceived risk and trust in Fintech, as well as their association with Fintech usage, need to be established in order to specifically examine uncertainty in the context of Fintech. While the influence of trust and risk on different digital services has been discussed in several studies (Ashrafi & Easmin, 2022; Ashrafi et al., 2021), in the Fintech context, empirical and theoretical validation did not receive much consideration. Arner et al. (2015) stated that Fintech is an advancement for the finance industry where IT is considered to be a core factor. According to Shin & Choi (2019), Fintech applies to financial technologies that are basically IT-enabled. The increasingly active role of Information Technology in Fintech was illustrated by Ernst & Young (2015), which is not an enabler nor facilitator, but a true innovator. They firmly believed that Fintech's IT contributes to the improvement of general services instead of merely enhancing the performance and transcends the traditional value chains. Considering the key role of Information Technology in Fintech innovation, users will interpret IT quality as an indicator of the overall quality of Fintech; if Fintech's IT is of high-quality, the potential usage of Fintech will increase. That is, the consistency of IT may be a key aspect that encourages the willingness of the customer to use Fintech, contributing to Fintech's long-term survival. While the importance of Information Technology in Fintech has been underlined by several studies, empirical analysis which has discussed the impact of IT on the use of Fintech are found rarely (Ryu & Ko, 2020).

While both uncertainty and information technology have a significant impact on fintech's sustainable growth, there are only a few studies that examined the connections between uncertainty,

Information Technology, and continuous use of Fintech. However, a comprehensive understanding of the interconnection between uncertainty, Information Technology, and continual usage of Fintech will assist providers of Fintech to attract and maintain customers efficiently, eventually speeding Fintech's popularization. Therefore, by adopting an IT quality-based viewpoint to a trust-based paradigm, the study investigated Fintech continuity intentions. This research used three dimensions of IT quality suggested by DeLone & McLean's (2003) ISS (Information's Systems Success) model to assess overall expectations of Fintech's IT quality. These three dimensions are: quality of the service, information, and system. In order to increase consumer willingness to continue Fintech's further usage, the study then investigated how the quality of IT would enhance trust as well as decrease perceived risk. Considering the main role of Information Technology in Fintech, the quality of IT will influence the consumers' willingness to continue Fintech usage directly by offering easy and fast financial transfers with lower costs for transaction, and spatial as well as temporal flexibility using mobile apps (Ryu, 2018). Additionally, the study considers perceived risk and trust as mediators to assess and verify the impact of information technology on the use of fintech. It implies that the quality of IT can have a direct influence on the intentions of Fintech continuity if there are no mediation effects of trust and perceived risk. In other words, high-quality IT will solely facilitate the use of Fintech and retain the consumers. A complete mediation effect, however, implies that the quality of information technology has merely a direct influence intentions of Fintech continuity, leaving no true place for information technology to come up with innovativeness in the Fintech based platforms. Moreover, this study also presents transaction security as a moderating variable for the purpose of assessing the effect of transaction security on the association between trust and fintech continuance intention. Nevertheless, trust has also been considered as a moderator for examining its impact on the association between risk and fintech continuance behavior.

This study, therefore, aimed at (1) exploring the impact of perceived risk and user trust on the intention of Fintech's continuity; (2) analyzing the impact of IT quality on perceived risk and user trust; (3) determining the influence of the quality of information technology on the intention of fintech's continuity; (4) exploring the moderating roles of transaction security and trust.

The study contributes to the existing body of literature in various ways. Firstly, the study validated the connection between three Information Technology attributes: perceived risk, trust, and subsequent intention of Fintech's continuation empirically, using data obtained from 263 users of Fintech in Bangladesh. Secondly, this study adds to the body of knowledge by offering valuable insight into how the quality of Information Technology affects Fintech's uncertainty as well as consecutive consumer intentions and how the distribution of Fintech technologies impacts perceived risk and trust to ensure successful growth of Fintech in the coming years. Thirdly, theoretical arguments of the study will contribute by assisting the policymakers and professionals to better integrate Information Technology into the development of their service so that they can maximize the success of innovation, thus ensuring Fintech's sustainable development. Moreover, this study enhances the theoretical depth by highlighting whether perceived risk and trust has any mediating impact on the association between perceived IT quality and fintech continuance intention. Finally, the study provides theoretical contribution by exploring and highlighting the moderating roles of both transaction security and trust; and discusses how they can affect an individuals' decision to use Fintech based applications.

The first section of the paper is an introduction followed by a review of relevant literature. The conceptual outline has been suggested and developed in the second section followed by the discussion related to methodology. Next, the findings are presented and discussed thoroughly. Finally, the study will be concluded by encapsulating the findings and highlighting the limitations along with both theoretical and managerial implications.

THEORETICAL BACKGROUND

The speed of technical transition is constantly growing and becoming more transformative each day. In recent years, the financial service sector has been dominated by IT innovation followed by a restructuring of services and process disruption (Anifa et al., 2022; Gomber et al., 2018). 'Fintech' basically refers to innovation in the financial industry that focuses on IT-enabled business models designed to disintermediate financial transactions (Xu, 2022). Here, disintermediation, an integral aspect of Fintech, refers to bypassing or replacing the existing financial institutions in the context of finance transactions.

When compared to conventional e-commerce or e-banking transactions, Fintech entails more risks and uncertainty since Fintech's risks are not limited to security and privacy, but applies to multidimensional topics such as efficiency, performance, transaction procedures, and risk of social, financial, legal, as well as time loss (Cortina & Schmukler, 2018; Ryu, 2018). P2P (peer-to-peer) lending agreements can be taken as an example in this regard. During economic recessions, it may lead the P2P lenders to bankruptcy because the profitability here relies heavily on the loans they offer by risking their balance sheets (Demirgüç-Kunt et al., 2015). The speedy global reach and anonymity of some cryptocurrencies, i.e. Bitcoin can make tax evasion, money laundering, and the financing of criminal activities easier for payment services (Cortina & Schmukler, 2018). Fintech companies that provide remittance services worldwide are struggling with financial regulations that are unique to each region (Gomber et al., 2018). Consequently, some consumers are afraid to use Fintech because of the unpredictable nature of Fintech transactions. Studies have found that because of Fintechs' elevated levels of risk and uncertainty, it is more like a complement to conventional financial firms than a rival (Cortina & Schmukler, 2018; Gomber et al., 2018). Enhancing consumer trust while reducing the risks can be a key to the Fintech industry's success.

Additionally, in conventional financial firms, a connection between Information Technology and financial services was initially implemented to the back-end of monetary operations. However, from the back-end to front-end transactions, retail banking, online lending, cross-border transactions, cryptocurrencies, etc., financial innovations have been further extended through Fintech (Gomber et al., 2018). According to Ernst & Young (2015), information technology is a real innovator in evolving Fintech that is disrupting and changing traditional services, distribution networks, and transaction structures, resulting in significant improvements. Since Information Technology has a greater effect on Fintech compared to conventional e-banking, users might consider the quality of Information Technology as a representative of the overall efficiency of Fintech. Even though IT has a significant influence on Fintech's sustainable growth, in the context of Fintech, earlier researchers did not concentrate much on its impact on continuous usage and other variables.

Owing to the implied risk and uncertainty in Fintech operations, trust is regarded to be more important in Fintech compared to conventional e-banking and e-commerce transactions. In financial transactions, two functions of trust have been established by previous studies. First, in order to capture consumer's behavior, trust is essential. According to Kim et al. (2008), trust will lift consumer's expectations of successful transactions and increase their satisfaction with the service. In the context of different digital service, i.e. internet banking (Namahoot & Laohavichien, 2018), mobile banking (Sharma & Sharma, 2019; Zhou, 2012), e-commerce (Kim et al., 2008), mobile payments (Gao & Waechter, 2017; Yan & Yang, 2015), online social networks (Pratono, 2018; Wu et al., 2014), and mobile shopping (Marriott & Williams, 2018; Yang, 2016), trust can have a positive impact on consumer intentions. Fintech firms can maintain current customers and gain new ones at the same time if they ensure a safe environment for their users as well as assure them with secured transactions. Second, in unpredictable situations, trust can minimize risk and uncertainty. Several previous reports proved that trust has

minimized potential risks in internet banking (Namahoot & Laohavichien, 2018), mobile banking (Luo et al., 2010), e-commerce (Kim et al., 2018; Pavlou, 2003; Pavlou, 2004), mobile shopping (Marriott & Williams, 2018; Groß, 2016), and mobile payments (Gao & Waechter, 2017; Slade et al., 2015). Particularly, trust can mitigate security and privacy issues in financial transactions, along with the risks associated with Fintech providers' opportunistic behavior (Marriott & Williams, 2018). Trust is vital since it can influence the behavior of Fintech usage while reducing risk and uncertainty. It is a reliable method for managing unpredictable and risky financial transactions effectively. Previous literature has defined trust as the belief of a customer that their expectations can be fulfilled without adding any risks (Mayer et al., 1995). Therefore, the study has defined trust as the belief of a customer that no reduction of a customer that a Fintech firm would satisfy its transactional commitments in order to meet the expectations of a user.

Perceived risk can be a significant obstacle while using behavior. It emerges from the customer's concern or uncertainty regarding the behavior along with potential adverse effects involved with the use of a certain service or good (Slade et al., 2015; Hsieh & Tsao, 2014). In overall behavioral intentions across the context of digital services, i.e. internet banking and mobile payment, perceived risk is regarded as a negative influence (Namahoot & Laohavichien, 2018; Gao & Waechter, 2017). In terms of risk (Wang & Lin, 2017), privacy and security have historically been considered as the major challenges. However, recent researches have included a multidimensional concept incorporating

challenges. However, recent researches have included a multidimensional concept incorporating performance, financial, social, physical, psychological, and time risks in customer transactions (Groß, 2016; Forsythe et al., 2006; Forsythe & Shi, 2003; Lim, 2003). Perceived risk, in this research, is characterized as the belief of a consumer regarding the ambiguity that leads to a Fintech transaction's possibly negative consequences. While several studies have explored the integration of perceived risk and trust during technological implementation and usage, only a few have established the connections between perceived risk, trust, and behavioral intentions of Fintech. Deep knowledge regarding the impacts of risk and trust on the continuous use of Fintech will help Fintech firms accomplish their objective of sustainable growth.

DeLone and McLean's ISS model (DeLone & McLean, 1992) has been widely used in various digital services to analyze consumer adoption and usage (Zhou, 2013). The original model presented two key factors: qualities of information and system. These are strongly associated with the usage of digital services as well as customer satisfaction and both have organizational and individual consequences. Later, by adding a service quality element that represents the efficacy of the service providers, DeLone & McLean (2003) expanded their initial model. The ISS model, therefore, consists of three dimensions of quality: information, system, and service. When assessing an individual Information Technology system's performance, quality of information and system are crucial components to consider, whereas service quality is critical for determining the overall effectiveness of an information system (IS) department (Delone & McLean, 2003). In B2B data sharing (Nicolaou & McKnight, 2006; McKnight et al., 2017), mobile banking (Sharma & Sharma, 2019; Zhou, 2012), e-commerce (Hsieh & Tsao, 2014; Hsu & Chang, 2014; Wang et al., 2016), virtual communities for information exchange (Zheng et al., 2013), and mobile payment apps (Gao & Waechter, 2017; Zhou, 2013), extensive research has been carried out to forecast continuing intentions by incorporating the ISS model with perceived risk or trust.

Nevertheless, the ISS model was considered to be an effective instrument to test the concept of this study since its three quality dimensions were shown to have a substantial effect on perceived risk and consumer trust along with behavior in mobile and online environments (Namahoot & Laohavichien, 2018; Gao & Waechter, 2017; Wang & Lin, 2017; Hsieh & Tsao, 2014). The three dimensions of quality are conceptualized here as risk mitigators as well as potential trust facilitators that implicitly affect continuing intentions in Fintech.

RESEARCH MODEL AND HYPOTHESES

The study applied the perspective of an Information Technology quality to a trust-based model in order to explore the connection between Information Technology, uncertainty, and continuing purpose in the context of Fintech. To evaluate the quality of IT in Fintech, the study used three dimensions of IT quality (i.e., quality of information, system, and service) suggested by the ISS model. Later, by adapting the three dimensions of IT quality as antecedents of perceived risk and trust, the proposed model sought to examine the intentions of Fintech continuity based on the model of Nicolaou & McKnight (2006). The study also applied a construct named transaction security to examine the moderating impact of transaction security on the association between trust and continuous intention of using Fintech by referring to a decision-making model based on trust, suggested by Kim et al. (2008).

Moreover, this study also considered trust as a moderating variable and aimed to examine its moderating effect on the relationship between perceived risk and fintech continuance intention. Finally, the mediation impact of perceived risk and trust was established between the intentions of Fintech continuity and the three dimensions of IT quality. Figure 1 illustrates the overall research model:



Figure 1: Research framework

The perceived risk theory indicates that perceived risk has a negative influence on the behavioral preferences of consumers regarding different digital resources (Ashrafi et al., 2021; Ashrafi et al., 2020; Nicolaou & McKnight, 2006; Groß, 2016; Luo et al., 2010). When customers use evolving services like Fintech, a digital service, they face risks, because there's a possibility that their purchases may not go as per their plan (Ashrafi et al., 2022). This scenario of crowdfunding and P2P lending can be taken as an example: There are no assurances regarding crowdfunding and P2P lending that Fintech providers will not behave unethically as well as opportunistically. Personal and financial details, such as identities, contact information, social security numbers, addresses, and even records of bank account and credit card

(Ryu, 2018), can be misused by Fintech firms. In addition, users of Fintech may incur financial losses as their financial transfers may not work as planned or may be related to money laundering, tax evasion, or even the financing of illicit activities (Cortina & Schmukler, 2018). Therefore, Fintech consumers pay attention to the risks that could lead to possible negative results and such risks can weaken their desire to use Fintech continuously. The study, thus, postulates its first hypothesis:

H1: The perceived risk has a negative effect on the purpose of Fintech continuity

Trust has been identified as a key indicator of technology usage and adoption rates in recent IS studies (Ashrafi & Easmin, 2022). Since Fintech is not a financial service that offers face-to-face interaction, customers' concerns regarding their financial transactions reach beyond conventional financial service's security and privacy concerns (Iwashita, 2022). Trust is a crucial factor in Fintech's management of unpredictable and uncertain circumstances (Yan et al., 2021). It emerges when consumers assume that high-quality offerings (Wang, 2008) that support their clients are delivered by Fintech companies. For instance, Fintech providers can minimize customer fears and create interest in their products if they offer reliability and security to their customers; high-quality offerings that satisfy the needs of users; and up-to-date, reliable as well as detailed information (Abdul-Rahim et al., 2022).

That is, the user's desire to use Fintech will increase if they feel that it is trustworthy platform and this trust can mitigate potential risks related to Fintech transactions, the related system, and providers of Fintech as well as increase the confidence of customers in technology. Therefore, the study formulated the following hypotheses:

H2: Trust has a positive effect on the purpose of Fintech continuity.

Quality of system refers to views arising from the cumulative performance of Information Technology systems (Delone & McLean, 2003; Sharma & Sharma, 2019; Petter et al., 2008). The quality of a system reflects the technical aspects of the system, including reliability, stability, response time, accessibility, and ease of use. According to Lee & Chung (2009), the first impression of consumers is based on their experience with Information Technology systems. Complex user interfaces and weak system quality may lead Fintech customers to question a Fintech provider's overall competence, resulting in increased perceived risks as well as declined confidence. Users of highly efficient Fintech services, on the other hand, are expected to trust Fintech, resulting in a willingness to pay along with the continued use of service (McKnight et al., 2002). E-commerce, online banking, mobile banking, and payments have illustrated the impact of system quality on consumer trust (Song, 2010; Zhou, 2013; Wang et al., 2016). Consumer's perceived risks are correlated with technical support (Forsythe & Shi, 2003). Fintech customers are more likely to be worried about the disclosure of their personal and financial records, nonperformance triggered by system failure and malfunctions in the Fintech systems if they find the system slow, unstable, inefficient, and hard to use (Rvu, 2018). Consumers may conclude with low-quality Information Technology systems that Fintech providers lack the potential to generally deliver high-quality services, which results in greater perceived risk as well as lower trust in Fintech. Thus, the study postulates the following:

H3: Trust is positively influenced by system quality.

H4: The quality of the system impacts perceived risk adversely.

The quality of information refers to an individual's understanding of the capability of service providers to satisfy the needs of the customer (Delone & McLean, 2003; Sharma & Sharma, 2019; Petter et al., 2008). The high-quality information is precise, relevant, helpful, and detailed (Wang & Lin, 2017). Because consumers prefer to rely mostly on current, insightful, timely, and accurate information from service providers, Nicolaou & McKnight (2006) have emphasized the significance of information quality

DETERMINANTS OF FINTECH SERVICE CONTINUANCE BEHAVIOR

in establishing trust in online experiences. Consumer trust improves when service providers deliver higher-quality information. For instance, while users expect to make payments for goods or services and collect the information at anytime and anywhere through mobile apps, inadequate, outdated, or obsolete information can cause customers to question the information processing capabilities of Fintech providers (Zheng et al., 2013; Lee & Chung, 2009). Previous studies have shown a powerful and supportive association between trust and the quality of the information in mobile and online environments (Nicolaou & McKnight, 2006; Gao & Waechter, 2017; Zhou, 2013; McKnight et al., 2017). In addition, the quality of information can help in minimizing uncertainty, since unpredictable results can be mitigated by shared, reliable, recent, and appropriate information. Trust in information quality can reduce potential risks when high-quality information serves the needs of consumers. The study, therefore, proposed the following hypotheses:

H5: The quality of information has a positive impact on trust.

H6: The quality of information adversely impacts the perceived risk.

The quality of service is characterized as an individual's understanding of the support level obtained from a department of IS and its information technology support system (Delone & McLean, 2003; Wang et al., 2016; Petter et al., 2008). It typically demonstrates the benevolence and abilities of the service providers, representing responsiveness, reliability, personalization, and capacity assurance (Gao & Waechter, 2017; Wang & Lin, 2017). In previous IS research, a favorable impact on consumer trust has been linked to the quality of service (Namahoot & Laohavichien, 2018; Zhou, 2012; Gao & Waechter, 2017; Wang & Lin, 2017). Fintech's trust is powered by the confidence of users that service providers can fulfill their commitments, carry out financial transfers, and are attentive to the needs of customers rather than their own interests (Pavlou, 2004). For instance, consumers believe that a service provider can fulfill their expectations when they offer instant feedback and highly qualified service. Additionally, professional and personalized services using mobile apps will minimize the effort and time involved in financial transactions and will offer pleasant experiences for consumers, contributing to improved consumer trust (Gao & Waechter, 2017). Fintech providers can characterize service quality to be a distinguishing factor that can boost consumers' trust. However, in digital services, service quality negatively affects perceived risk (Namahoot & Laohavichien, 2018; Hsieh & Tsao, 2014; Forsythe et al., 2006). For example, if a Fintech company delivers inefficient, unprofessional, and slow service, the user's perceived risk associated with the provider may significantly increase. Therefore, the study hypothesized:

H7: The quality-of-service impacts trust positively.

H8: quality-of-service adversely impacts perceived risk.

In the ISS model, the three quality variables i.e. information, system, and service qualities, were found to be entirely mediated by perceived risk and trust in different digitized services (Namahoot & Laohavichien, 2018; Wang & Lin, 2017; Hsieh & Tsao, 2014; McKnight et al., 2017). However, by offering easy and rapid processes, minimizing transaction costs, and incorporating economic benefits, these three variables can directly impact Fintech's continuing intentions in the real world, considering the growing role of Information Technology in Fintech (Nicolaou & McKnight, 2006). Previous studies have not provided any empirical evidence between Fintech's continuance intention and the three forms of Information Technology quality for the mediating effects of perceived risk and trust. That is, while perceived risk and trust are likely to have major mediating effects, the impacts of these three forms cannot be entirely mediated in any setting. High-quality Fintech platforms, for instance, may attract and keep Fintech customers on their own and there could be a partial mediation impact of perceived risk and trust between the quality of the system and the intention of continuing Fintech. Thus, the study formulates the following hypotheses:

H9: Trust partially mediates the influence of system quality on the purpose of Fintech's continuity.

H10: Perceived risk partially mediates the system quality's influence on the purpose of Fintech's continuity.

H11: Trust partially mediates the influence of information quality on the purpose of Fintech's continuity.

H12: Perceived risk partially mediates the information quality's influence on the purpose of Fintech's continuity

H13: Trust partially mediates the influence of service quality on the purpose of Fintech's continuity.

H14: Perceived risk partially mediates the service quality's influence on the purpose of Fintech continuity.

Moderating impact of transaction security and perceived trust

Online transactions are considered uncertain and risky. This uncertainty includes factors like financial risk (losing money) and security risk (breach of personal information such as address, personal cell phone number). In this study we propose transaction security by combining the financial and security dimension of perceived risk. Transaction security impacts consumers risk perception and refers to the evaluation of consumers that the transactions are error free so that the adverse consequences can be avoided (Kaur & Arora, 2020). Studies showed that transaction security reduces an individual's anxiety level and impacts their trust level (Xin et al., 2020; Khalilzadeh et al., 2017). Chen et al. (2012) argued that transaction security is a pivotal factor that drives consumer's intention to engage in online purchasing. Transaction security is a perceived risk component that is connected to the transaction process (Kaur & Arora, 2020). Urban et al. (1999) argued that consumers only participate on online purchasing when they feel that their personal data and payment is secured and protected. These studies highlight that perceived transaction security is inextricably connected with consumer' level of trust and behavioral adaptation. Study conducted by McCole et al. (2010) showed that perceived privacy and security concerns moderate the association between consumers trust level and their attitudes towards online purchasing. Hence, insufficient transaction security can cause consumers to find the transaction risky and uncertain and impacts their decision to engage in any online based activities. Moreover, such risk perception can impact consumers trust level when it comes to paying online (Leeraphong & Mardio, 2013). Additionally, study conducted by Syah et al. (2020) showed that if consumers can be given a sense of transaction security, it may increase their purchasing intention. Prior research on trust, risk and behavioral intention showed that consumers who perceive higher level of risk seem to have a lower level of trust, lowering their behavioral intention (Putra et al., 2017). Ling et al. (2011) showed that consumers having risk and uncertainty impacted their trust level which eventually had an impact on online purchasing. Therefore, from the context mentioned above, we hypothesize that individuals who perceive a higher level of transaction security will have higher level of trust and will be more prone to continue using fintech. In other words, transaction security will have a positive moderating effect on the relationship between trust and fintech continuance intention. Therefore, the following hypothesis is postulated:

H15: Transaction security will positively moderate the relationship between trust and fintech continuance intention.

It is still unclear if perceived risk is a predecessor or an effect of trust, making it a difficult task to establish the link between perceived risks and trust (Aldas- Manzano et al., 2011). Studies conducted in

the field of e-marketplace showed that trust reduces an individual's stress level, anxiety and privacy concerns which acts as a precursor to their participation in online transactions (Chang & Wong, 2010). Pavlou & Gefen (2004) suggested that trust is one of the vital elements that lowers the impact of perceived risk on an individual's behavioral intention. Aldas-Manzano et al. (2011) argued that an individual's trust works as an insurance against any sort of unexpected behavior and perceived risk. Depending on their perceived risk levels, an individual's trust levels may differ and however, according to Harridge- March (2006), the level of trust requires to be higher than the level of perceived risk in order to attain the optimal balance amongst trust perceived risk. An individual who perceives the risk to be of higher level will not reveal their personal information unless the perceived trust exceeds their perceived risk levels. Contrarily, if the level of trust does not exceed an individual's perceived risk level, they will keep the associated risks on focal point while participating in online transactions (Kaur & Arora, 2021). Thus, it can be deduced that trust will have a moderating effect on the negative association amongst behavioral intention and perceived risk. Prior studies on online banking have shown that risk-averse individual's loyalty towards using a website and online banking is enhanced only if their trust level surpasses their perceived risk levels (Kaur & Arora, 2021; Aldas-Manzano et al., 2011). Hence, from the perspective of fintech, it can be argued that minimizing individual's risk level through increasing trust levels will influence and encourage them to use financial technology based services. Therefore, we propose that trust will moderate the negative association between an individual's behavioral intention and perceived risk, considering for lesser degrees of trust, the intensity between the other two variables will be increased. So, the following hypothesis is postulated:

H16: Trust will positively moderate the association amongst fintech continuance intention and perceived risk

RESEARCH METHOD

Measurement Development

To ensure the accuracy of the content, survey items were established through an extensive literature review. IS reports and a review of prior innovations established multiple item measurements of seven constructs. From Featherman & Pavlou (2003) and Kim et al. (2008), the study assessed three elements of both perceived risk and trust. In the ISS model, the three dimensions of Information Technology quality (i.e. quality of information, system quality, and quality of service), were evaluated by 4 elements taken mainly from Bharati & Chaudhury (2004). As a dependent variable, Fintech continuance intention's measurement were made on the basis of 4 elements from Chen (2013) and Lee (2009). Transaction security was measured by using 4 items from the study of Kim et al. (2010). A 5-point Likert scale ranging from "strongly disagree (1)" to "strongly agree (5)" was the basis for all measures. In the research model, Fintech type, age, education, gender, period as well as the frequency of use were used as control variables. According to Dapp et al. (2014), the adoption and use of Fintech vary by age, gender, income, education, and users' propensities because, in technology acceptance research, these are considered as significant demographic variables (Gefen & Straub, 1997; Venkatesh et al., 2003). The respondents answered if they were either male or female and their age and education level too were

measured using ordinal scales (five categories for age, four categories for education level, respectively). A dummy variable consisting of 4 Fintech services was implemented to monitor the Fintech type (i.e., P2P lending, mobile remittance, mobile payment, and crowdfunding). Since recent studies (Gulamhuseinwala et al., 2015; Kuo Chuen & Teo, 2015) have defined frequency as one of the important factors influencing the intentions of Fintech use, the study monitored frequency (six categories) of Fintech use by employing ordinal scales.

Data Collection

To assess the validity and reliability of all variables, a pre-test was performed by concentrating on 27 respondents who used Fintech. The pre-test resulted in a major refinement. It restructured the questionnaire and developed the internal validity and initial face of the measures. Within the time frame of 2 months, questionnaires were circulated to 423 participants after the pre-test. We used the purposive sampling technique, and the participants were provided with the survey form only if they met two criteria: i. participants must have heard of Fintech and ii. participants must have experience of using Fintech actively for more than 2 months. Since the samples were chosen deliberately, purposive sampling seemed relevant and appropriate (Alkassim et al., 2016). Through this purposive selection of respondents, the study aimed to confirm whether respondents were current users of Fintech and understood the survey context thoroughly. In the event that any inconsistency was found, the data was excluded along with the respondent. Overall, the form was distributed to 423 participants using online platforms, out of which 275 responses were received and 263 responses were found to be valuable for this analysis, leading to a 60% response rate. The characteristics of the respondents are summarized in Table 1. As illustrated in Table 1, 71% responses came from mobile payment, 7% from mobile remittance and 22% from donation-based crowdfunding. 35% of respondents used Fintech on a monthly basis whereas 12% of respondents used Fintech every six months. A large portion of respondents was aged between 18 to 30 years (35 %). Most of the respondents had a master's degree (49%) followed by a bachelor degree (38%).

		Frequency	Percentage
Gender	Male	160	68
	Female	103	32
	Total	263	100
Age	Less than 18	8	3
	18-30	93	35
	31-40	84	32
	41-50	75	29
	Over 50	3	1
	Total	263	100
Fintech type	Mobile payment	187	71
	Mobile remittance	18	7
	P2P lending	0	0
	Total	263	100
	Donation based crowdfunding	58	22
Education	Basic/secondary	23	9
	Bachelor	103	39
	Master	130	49
	PhD	7	3
	Total	263	100
Frequency of use	Daily	2	1.47
	Weekly	44	17
	Monthly	93	35
	Every 3 months	88	33

Table 1: Descriptive statistics

Every 6 months	32	12
Once a year or less	3	1.15
Once two years or less	1	0.38
Total	263	100

ANALYSIS AND RESULTS

The PLS tool (partial least squares) was used to test the proposed model of the study along with the hypotheses. Taking the early phase of developing the theoretical model for identifying the impact of Information Technology quality on perceived risk, trust, and continuing intentions of using Fintech, the adaption of partial least squares tool seemed to be favorable (Chin, 1998). Another reason for employing PLS tool is the small size (n=275) (Chin, 1998). A two-step approach based on Gefen et al. (2000), was implemented to analyze the data. The very first step evaluated the numerical analysis and a structural model test was included in the second step. To evaluate the measurements including the structural models, Smart PLS version 3.3.3 was used.

Measurement Model

The measurement model evaluated through ensuring content validity, convergent validity and discriminant validity. The discriminant validity was measured by using Fornell-Larcker criterion and HTMT ratio and all of the values met the required benchmark (Hair et al., 2016; Henseler et al., 2015; Teo et al., 2008; Fornell & Larcker, 1981). Multiple pre-test and pilot tests were conducted to verify the content (Straub et al., 2004). For each construct, the study measured the composite reliability (CR), average variance extracted (AVE), and Cronbach's alpha for the responsibility test. As mentioned in Table 2, the recommended threshold of 0.70 was surpassed for both the CR values and Cronbach's alpha (Hair et al., 2016). Additionally, all numbers of AVE surpassed the acceptance rate of 0.5 (Fornell & Larcker, 1981), fostering convergent validity. Furthermore, all constructs' SAVE values surpassed the correlation with the other constructs. The values of variance inflation factor (VIF) were observed to range from 1.297 to 2.821, showing no multicollinearity issues (Petter et al., 2008). Finally, we assessed the inner VIF values to test whether there is any common method bias in the model, and it was revealed that all of the values were below the required threshold of 3.30 (Kock, 2015). Therefore, the model was free from common method bias as no abnormality was detected. These observations proved the measurement model to be ideal for further study.

Lable 2 . Rendonity di	na vanany or constru	015	
Construct	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
FCI	0.933	0.952	0.832
INFQ	0.876	0.914	0.728
TRNSRT	0.865	0.917	0.788
PRSK	0.815	0.89	0.73
TRST	0.836	0.901	0.753
SRVQ	0.861	0.906	0.706
SYSQ	0.70	0.816	0.528

 Table 2: Reliability and validity of constructs

Note. FCI, Fintech continuance intention; INFQ, Information quality; TRNSRT, Transaction security; PRSK, Perceived risk; TRST, Trust; SRVQ, Service quality; SYSQ, System quality

	FCI	INFQ	TRNSRT	PRSK	TRS T	SRVQ	SYSQ
FCI	0.912						
INFQ	0.429	0.853					
TRNSRT	0.616	0.516	0.887				
PRSK	0.49	0.512	0.559	0.854			
TRST	0.731	0.441	0.53	0.353	0.868		
SRVQ	0.637	0.578	0.571	0.525	0.559	0.84	
SYSQ	0.387	0.367	0.37	0.474	0.34	0.42	0.727

 Table 3: Assessment of Discriminant validity (Fornell-Larcker criterion)

Note. FCI, Fintech continuance intention; INFQ, Information quality; TRNSRT, Transaction security; PRSK, Perceived risk; TRST, Trust; SRVQ, Service quality; SYSQ, System quality

Table 5. Assessment	of Discrimina	in valuity (III MIT)	(au)			
	FCI	INFQ	TRNSRT	PRSK	TRST	SRVQ
FCI						
INFQ	0.458					
TRNSRT	0.558	0.611				
PRSK	0.813	0.495	0.412			
TRST	0.71	0.66	0.624	0.656		
SRVQ	0.478	0.469	0.618	0.427	0.549	

Table 3: Assessment of Discriminant validity (HTMT ratio)

Note. FCI, Fintech continuance intention; INFQ, Information quality; TRNSRT, Transaction security; PRSK, Perceived risk; TRST, Trust; SRVQ, Service quality; SYSQ, System quality

Structural Model

Using the PLS tool, the structural model was calculated in the second phase. In the proposed model, Figure 2 indicates the outcomes of PLS, including significant levels of paths and path loading. Study showed that only the Fintech type demonstrated a strong and positive correlation with the continuity intention ($\beta = 0.110$, p < 0.05), out of the other six control variables. The study model, however, accounted for 34.2% of the perceived risk, 39.8 % of the trust variance, and 63.8% of the intentions for continuous use of Fintech.



Figure 2 indicated that the willingness of respondents to continuously use Fintech was adversely affected by perceived risk ($\beta = -0.172$, p = 0.005), which supports H1. On the other hand, Trust was positively linked to the intentions of Fintech's continuity ($\beta = 0.550$, p < 0.001), which supports H2. Findings revealed that the continuing intention of Fintech was positively affected by trust, on the other hand, it was negatively affected by the perceived risk. The greater impact of trust here suggested that consumers were keen to use Fintech continuously. The findings also revealed that the quality of the system had a significant impact on trust ($\beta = 0.105$, p = 0.041), while the perceived risk was negatively affected by it ($\beta = -0.286$, p = 0.000). Therefore, both H4 and H5 were supported. The quality of information influenced trust favorably ($\beta = 0.157$, p = 0.016) and it had major impact on perceived risk (β = -0.263, p = 0.000). Hence, it offered support for both H6 and H7. Trust was positively affected by the quality of service ($\beta = .424$, p = 0.000) but the perceived risk was negatively affected ($\beta = -0.261$, p =0.001), therefore supporting H8 and H9. This result demonstrates that the quality of the service, information and system were connected with both perceived risk and trust. However, system quality was more strongly connected to perceived risk compared to trust. In contrast, a stronger association between service quality and trust were observed in comparison to the association between service quality and perceived risk.

It was assumed that perceptions of consumers regarding Information Technology's quality influenced the intentions of Fintech continuity both directly and indirectly through perceived risk and trust. Therefore, the study verified 6 mediated directions in two separate methods. First, in order to verify the mediation effects of perceived risk and trust in the proposed research model, a Sobel test was performed (Sobel, 1982). 5 of the 6 mediation paths through perceived risk and trust were relevant at p values of <0.01, <0.05 as defined in Table 4. The findings indicated that the ties between the service, system, information quality and the intention to continue using Fintech (z = 4.122, p = 0.000; z = 1.666, p = 0.047; z = 2.002, p = 0.021) were statistically mediated by trust, as seen in Table 4. The links between service quality and Fintech's continuity intention (z = 1.439, p = 0.044) was mediated by perceived risk (z = 1.629, p = 0.041) significantly. Moreover, results showed that the relationship between information quality and continuance intention was not moderated by perceived risk (z = 1.646, p = 0.073).

Mediated Path	Path Coefficient	Standard Error	z-Value	p- Value
SVSO > TPST > ECI	0.058	0.033	1.666	0.047
515Q -> 1K51 -> 1C1	0.55	0.058		
SYSO -> PRSK -> FCI	-0.045	0.019	-1.629	0.041
515Q -> 1K5K -> 1C1	0.167	0.064		
INFO -> TRST -> FCI	0.086	0.042	2.002	0.021
	0.554	0.058		
INFO -> PRSK -> FCI	-0.044	0.021	-1.646	0.073
	0.173	0.065		
SRVO -> TRST -> FCI	0.233	0.045	4.122	0.000
	0.477	0.07		
SRVO -> PRSK -> FCI	-0.044	0.025	1.439	0.044
	0.165	0.066		

Table 4: Results of Sobel test of mediated paths from quality to Fintech continuance intention

Note. FCI, Fintech continuance intention; INFQ, Information quality; TRNSRT, Transaction security; PRSK, Perceived risk; TRST, Trust; SRVQ, Service quality; SYSQ, System quality

As seen in Table 5, the study defined the direct, indirect as well as total influences of every path. 5 of the 6 indirect influences of the mediation paths were significant at 0.05 level, which was consistent with the findings of the Sobel test. The finding also indicated that the both trust and perceived risk mediated the association between quality of the system ($\beta = 0.105$, p=0.041; $\beta = -0.268$, p=0.000) and continuance intention. While trust mediated the path between quality of information ($\beta = 0.157$, p=0.016) and continuance intention, perceived risk did not. Furthermore, both perceived risk and trust mediated the quality of service ($\beta = 0.424$, p=0.000; $\beta = -0.261$, p=0.001). Nevertheless, the study revealed influences between dimensions of quality & the intention of Fintech's continuity. Quality of information, service and system impacted the intention to continue using Fintech ($\beta = 0.13$, p=0.001; $\beta = 0.277$, p=0.000; $\beta = 0.102$, p=0.002). This indicates that the perceived risk partially mediated the association between quality of system and continuance intention. Moreover, the path of service quality and continuance intention system and service. Moreover, both perceived risk and trust partially mediated the quality of information system and service. Moreover, both perceived risk and trust partially mediated the between the quality of the service and system with continuance intention.

Table 5:	otal effect, direct effect and indirect effect	

. . ..

Path	Direct effect	Indirect effect	Total effect	p value
PRSK -> FCI	-0.167	-	-0.167	0.005
TRST -> FCI	0.55	-	0.55	0.001
SYSQ -> TRST	0.105	-	0.105	0.041
SYSQ -> PRSK	-0.268	-	-0.268	0.000
SYSQ -> FCI	-	0.102	0.102	0.002
INFQ -> TRST	0.157	-	0.157	0.016
INFQ -> PRSK	-0.263	-	-0.263	0.000
INFQ -> FCI	-	0.13	0.13	0.001
SRVQ -> TRST	0.424	-	0.424	0.000
SRVQ -> PRSK	-0.261	-	-0.261	0.001
SRVQ -> FCI	-	0.277	0.277	0.000

Note. FCI, Fintech continuance intention; INFQ, Information quality; PRSK, Perceived risk; TRST, Trust; SRVQ, Service quality; SYSQ, System quality

Accordingly, the findings of these mediation tests showed that both perceived risk and trust mediated the association amongst quality of the system and service and continuance intention, as seen in Table 6, which did support H10 and H11. The results also revealed that the influence of the quality of information on the intentions of continuity was partly mediated by trust, which supports H12, but not H13. The influence of service quality on continuity intent was partially mediated by both perceived risk and trust. H14 and H15 were therefore supported.

_ . . _ _

Hypothesis	Path from	Mediator	Path to	Type of mediated path	Decision
H9	SYSQ	TRST	FCI	Partial Mediation	Supported
H10	SYSQ	PRSK	FCI	Partial Mediation	Supported
H11	INFQ	TRST	FCI	Partial Mediation	Supported
H12	INFQ	PRSK	FCI	No Mediation	Not Supported
H13	SRVQ	TRST	FCI	Partial Mediation	Supported
H14	SRVQ	PRSK	FCI	Partial Mediation	Supported

Note. FCI, Fintech continuance intention; INFQ, Information quality; PRSK, Perceived risk; TRST, Trust; SRVQ, Service quality; SYSQ, System quality

Assessment of moderating effect

Next the moderation effect for the study was tested and according to the research model or conceptual framework, both perceived trust and transaction security have been proposed as moderators. Therefore, a multiple group approach has been employed to test the effect of moderation of consumers' trust perception and perceived transaction security (Chiu et al., 2014). We hypothesized that perceived trust will moderate the relationship between perceived risk and fintech continuance intention and transaction security will moderate the relationship between perceived trust and fintech continuance intention. Hence, the categories were generated through dividing the sample into two groups through their median of the respective variables. For assessing the perceived trust, one group of respondents (N=182) believed they had a higher perceived trust, while the other group included those respondents (N=196) who assumed the perceived trust to be low. Additionally, one group of respondents believed that they had higher transaction security while other group assumed that their security related to making transaction was low. Next, to evaluate the hypothesis, H16 and H17, the effect of moderation was tested. The moderation effect was statistically tested through the comparison of the values of path coefficients of participants' perceived risk to their willingness to continue to use fintech of people with high-trust perception with the corresponding path coefficients of people having lower trust perception. The same procedure was repeated to test participants' perceived trust on their willingness for fintech continuance intention with high-transaction security perception with the corresponding path coefficients of people perceiving lower transaction security. For this study, procedures suggested by Keil et al. (2000) have been followed as shown below:

$$S_{pooled} = \sqrt{\{\left[\frac{N_1 - 1}{N_1 + N_2 - 2}\right] X S E_1^2 + \left[\frac{N_2 - 2}{N_1 + N_2 - 2}\right] X S E_2^2\}}$$
$$t = (PC_1 - PC_2) / [S_{Pooled} X \sqrt{\left(\frac{1}{N_1} + \frac{1}{N_2}\right)}]$$

Where, S_{pooled} = Pooled variance estimator t= Test statistics with N1 + N2 -2 degrees of freedom Ni= Sample size for group i dataset SE= Standard path error for group i in the structural model PC= Path coefficient of group i

Results showed that (see table 7) the perceived trust (t=11.56, p< 0.001) had significant moderating effect on the association between perceived risk and continuance intention. In other words, perceived risk's negative impact on consumers' intention for continuing fintech based service was positively moderated by perceived trust. Therefore, for passengers who perceive the perceived trust to be high, the perceived risk will have a smaller effect on their willingness for participating in fintech based services compared to participants who perceive the risks to be of higher level. Additionally, transaction security (t= 9.14, p<0.001) was revealed to significantly moderate the relationship amongst trust and fintech continuance intention which implies that trust's positive impact on consumers' intention for using fintech was strengthened by transaction security. Therefore, for passengers who assume that the associated transaction security of using fintech based services is higher, the perceived trust will tend to have a greater effect on their intention for using these services

	Moderating					
Path of hypothesis	variable	High risk-β	Low risk-β	Difference	t value	Decision
H15: TRST→FCI	TRNSRT	0.57	0.46	0.11	9.14***	Supported
H16: PRSK→FCI	TRST	0.61	0.41	0.20	11.56***	Supported

Table 7: Moderating effect of perceived trust and transaction security

Note. *** p< 0.001

DISCUSSION

In pursuing sustainable growth, Fintech has faced crucial challenges because its disruptive nature leads to both uncertainties and innovations. This research, therefore, sought to explain the relationship between IT innovation, uncertainty, and eventual behavioral intention in Fintech. As Information Technology has a significant impact on Fintech's innovation, the study assumes that the quality of Information Technology affects the intention of Fintech continuance both directly and indirectly through the uncertainties. For this reason, by combining a trust-based model with an ISS model, the proposed model was established. Initially, the results showed that the quality of information is positively linked to trust, while the quality of the system is negatively related to the perceived risk, which is consistent with the earlier studies (Nicolaou & McKnight, 2006; Zhou, 2012; Gao & Waechter, 2017; Zhou, 2013; Wang et al., 2016). The findings revealed that the quality of the system primarily not only alleviates perceived risk, leading to better intentions for Fintech's continuity, but also has a direct impact on trust. The low standard of the system makes Fintech customers concerned about the reliability of transactions and thus makes them hesitant to use Fintech. User trust, however, does depend on having a high-quality system, since consumers frequently believe that for Fintech providers, a high-quality system is important. Moreover, service quality has revealed to be one of the most essential positive forces for building trust in using Fintech. Moreover, according to Zhou (2012), information quality reflects the trustworthiness of service providers. If the quality of information is poor, consumers can assume that Fintech suppliers are unable to provide quality service, resulting in a decrease in trust. The results suggest that consumers primarily depend on the quality of information to build trust and predominantly rely on the quality of the system to reduce perceived risk, eventually influencing the continuous usage of Fintech. Next, it was observed that high-quality service increases trust as well as minimizes perceived risk, and among the three dimensions of quality, it had the strongest effect on the intentions of using Fintech.







Figure 4: Moderating effect of trust

Earlier studies have shown that quality of service is essential in many e-commerce & e-banking services (Namahoot & Laohavichien, 2018; Gao & Waechter, 2017; Hsieh & Tsao, 2014; Xu et al., 2013) for facilitating behavioral intentions. The findings were consistent with existing research, and suggested that quality of service has a substantial impact on both perceived risk and trust. Results showed that service quality is marginally more effective in enhancing trust ($\beta = 0.424$, p = 0.000) than minimizing perceived risk ($\beta = -0.261$, p = 0.001). Therefore, high standards of service, such as instant responsiveness and a willingness to assist creates confidence among customers regarding the security of transactions on Fintech platforms which subsequently encourage them to continue using Fintech. Therefore, Fintech providing excellent service quality may minimize consumers' doubts and concerns regarding the abilities of providers through replacing fears with trust and confidence. For managing uncertainty as well as promoting the continuous use of Fintech, the importance superior service quality is essential (Ryu & Ko, 2020). Furthermore, the study found that each quality dimension had both direct and indirect effects on the intentions of continuing Fintech. According to earlier IS research, the three quality dimensions indirectly impacted the adoption and use of technology through perceived risk or trust (Namahoot & Laohavichien, 2018; Nicolaou & McKnight, 2006; Gao & Waechter, 2017; Zhou, 2013). In a similar vein, the study findings revealed that service and system quality dimensions influenced the intention of Fintech's continuity through perceived risk and trust, directly and indirectly. However, information quality impacted continuance intention through trust but to our surprise, it did not show any significant influence on the continuance intention through perceived risk. It demonstrated Information Technology's enhanced role in Fintech. The findings indicated that Information Technology's effect on attracting and retaining Fintech customers was expanded. System quality, however, had an indirect impact on the intention of Fintech's continuity through perceived risk, suggesting that systems of Information Technology have a limited capacity to drive users' behavioral intent by themselves. The overall results have demonstrated the enhanced role of Information Technology in Fintech than in other digitized services, which emphasizes the value of Information Technology for Fintech's sustainable growth. Furthermore, study showed that trust strengthens the intention of Fintech's continuity, actively and implicitly, which is compatible with previous research conducted by Ryu & Ko (2020). In this study, trust has revealed to be the strongest indicator of Fintech's continuity intentions. Several studies have found Fintech to be potentially unpredictable and uncertain. Thus, before participating in such financial platforms for making transactions, consumers need to gain confidence. This research also reported that fintech continuance intention is significantly enhanced by trust. Therefore, enhancing trust and riskmitigation strategies are needed to boost Fintech's continuance intentions and meet sustainable growth for Fintech providers.

Finally, the study tested the moderating impact of transaction security and trust. Firstly, it was revealed that transaction security positively moderated the association between users' trust and fintech continence intention (See figure 3). Transaction security is one of the most vital constituents that users consider while making online transactions (Kaur & Arora, 2021; Chen et al., 2012). It revealed that people who perceive the transactions to be more secure will perceive higher level of trust to participate or make transactions on the fintech platforms. In other words, users' who perceive the transaction security to be of higher level will perceive a lower level of risk due to enhanced trust (Xin et al., 2020; Khalilzadeh et al., 2017), which will provide them a sense of increased trust and influence them to use financial technology-based services to conduct financial transactions. Additionally, trust also positively moderated the association between perceived risk and fintech continuance intention (see figure 4) implying that people having more trust on fintech platform will tend to perceive the platform to be less risky (Chang & Wong, 2010) which will influence them to keep continuing to make transactions through the platforms. Prior studies have shown that an individual's engage in certain behaviors only if their trust level surpasses their perceived risk levels (Kaur & Arora, 2021; Aldas-Manzano et al., 2011). In other words, having more trust minimizes the fear and reduces users' anxiety level which in turn motivates them to use fintech based services. In essence, increased trust within the users weakens the relationship between perceived risk and continuance intention.

THEORETICAL IMPLICATIONS

This study focused on the relationship of system, information and service quality with trust and perceived risk which eventually affects fintech continuance intention. This study also emphasized the mediating impact of trust and risk on continuance intention. Prior research showed that both perceived risk and trust are core determinants that affect an individual's decision to use fintech. Therefore, this study has helped to gain a thorough and proper understanding of how these two variables, namely trust and perceived risk affect fintech continuance intention. It also explored how the paths between information, system and service quality and continuance intention was mediated by perceived risk and trust. This study enhances and adds to the body of the literature by highlighting the mediating impact of perceived risk and user trust. Therefore, it enriched the study by providing meaningful insights on consumer behavior research, particularly in the area of financial technology-based services. The study also advances the existing knowledge and enhances the theoretical depth by highlighting user trust and transaction security as moderators that acts as a vital factor that impacts the relationship of fintech continuance intention and perceived risk and trust respectively. Nevertheless, this study has focused on the components that influence consumers to use fintech and the results can provide meaningful insights to the marketers and policymakers for improving risk management and designing better experiences for actual and potential consumers.

MANAGERIAL IMPLICATIONS

This research highlights some significant implications from a managerial viewpoint. First, it offers valuable insight into methods for developing effective strategies for Fintech's innovation to realize Fintech's sustainable progress. The causal connection between Information Technology, perceived risk, trust, and the intention of continuing Fintech was identified in the research. For instance, the study discovered that when users feel that Fintech providers supply high-quality and trustworthy information, they develop trust and continue using Fintech because the quality of information is a powerful trust facilitator. Considering that perceived risk can be effectively mitigated by service and system quality, Fintech managers must understand that if Fintech providers offer high-quality Information Technology systems and services, customer concern regarding the intrinsic and uncertain risks of Fintech transactions can be lessened. By integrating Information Technology's growth with techniques of building trust and

DETERMINANTS OF FINTECH SERVICE CONTINUANCE BEHAVIOR

mitigating risks, the findings will provide proper direction to Fintech managers about innovation so that they can meet Fintech's sustainable growth. Second, the widespread role of Information Technology as a significant precedent of perceived risk, trust, and continuance intentions should be acknowledged by Fintech managers. According to earlier research conducted on digitized services, the quality of Information Technology had an indirect influence on trends of behavioral usage and those researchers have identified perceived risk and trust as complete mediators. However, the study observed that Fintech's continuity intention is influenced by the quality of information and service both directly and indirectly, whereas the quality of the system affects them indirectly only. Specifically, service and information's high quality will improve trust directly, will reduce potential risk both directly and indirectly, and, at the same time, will directly encourage continuing intentions. The results indicate that service and information quality are essential aspects of customer retention techniques in Fintech systems. Therefore, Fintech managers should concentrate on improving Fintech's IT quality in order to draw and maintain Fintech customers, encouraging innovation in Fintech as advantageous in the long run.

Finally, this study indicates that managers must develop trust to foster the continued use of Fintech. A trust-building strategy is crucial to enhancing the use of behavioral trends in Fintech and reducing uncertainty, considering uncertainty challenges from Fintech's disruptive nature. According to the results, high-quality service and system will reduce perceived risk, which will lead to increased trust levels. Quality of Information is considered as the strongest and most direct facilitator of trust and, among the three quality dimensions, it has the most significant impact on trust. Therefore, Fintech providers need to concentrate Fintech innovations on how they can develop trust through the implementation & use of emerging information technology in order to ensure Fintech's sustainable growth.

LIMITATIONS, CONCLUSION AND DIRECTIONS TO FUTURE RESEARCH

This research is associated with several drawbacks, including some that indicate directions for future studies. First, while in a Fintech context, the study assessed unidimensional constructs of perceived risks and trust; multidimensional, multifaceted risk and trust were not studied. Since the results of unidimensional perceived risk and trust can be biased, further analysis can offer valuable insights into multifaceted trust such as expertise, benevolence, and integrity as well as perceived risk such as legal, financial, privacy, security-related, time risks, and performance in order to catch the trends of post-adoption in the context of Fintech. After that, while the study was conducted focusing on an ISS model combined with a trust-oriented model, alternate frameworks may also clarify various links between the quality of Information Technology, perceived risk, trust, & the intentions of continuing Fintech. For instance, between the perceived risk and the intent to continue (Mayer et al., 1995), the trust could be used as a moderator. According to this view, trust only influences behavioral intentions when transactions are considered risky. Moreover, the association between perceived risk and trust may be non-recursive in another perspective (Mitchell, 1999). Future research should explore how these alternate models can supplement interpretations of Fintech-use trends and how these models can be incorporated, considering the early phase of Fintech study.

Thirdly, this analysis is an overview that reflects on Fintech's post-adoption behavior; the dynamic and evolving nature of the Fintech-use phenomenon is not considered here. Ideally, longitudinal studies are required that can evaluate the adoption patterns of Fintech over time. This research indicates that by contrasting pre- and post-adoption behaviors, future initiatives can offer useful insights into the dynamic characteristics of Fintech's adoption behavior eventually. Finally, the cultural influences present in the study's empirical context, i.e., Bangladesh, restrict the capability to generalize the findings to wider

contexts, such as Singapore, the United Kingdom, the United States, Hong Kong, and China. Future studies involving distinctive cultural contexts can improve both external validity and generalizability.

REFERENCES

- Abdul-Rahim, R., Bohari, S. A., Aman, A., & Awang, Z. (2022). "Benefit–Risk Perceptions of FinTech Adoption for Sustainability from Bank Consumers' Perspective: The Moderating Role of Fear of COVID-19". Sustainability, Vol 14 No. 14, p. 8357.
- Abramova, S. & Böhme, R. (2016), "Perceived Benefit and Risk as Multidimensional Determinants of Bitcoin Use: A Quantitative Exploratory Study", *ICIS 2016 Proceedings*, available at: https://aisel.aisnet.org/icis2016/Crowdsourcing/Presentations/19 (accessed 30 May 2021).
- Aldas-Manzano, J., Ruiz-Mafe, C., Sanz-Blas, S. & Lassala-Navarré, C. (2010), "Internet banking loyalty: evaluating the role of trust, satisfaction, perceived risk and frequency of use", *The Service Industries Journal*, Routledge, Vol. 31 No. 7, pp. 1165–1190.
- Alkassim, R. S., Tran, X., Rivera, J. D., Etikan, I., Abubakar Musa, S., & Sunusi Alkassim, R. (2016). "Comparison of Convenience Sampling and Purposive Sampling". *American Journal of Theoretical and Applied Statistics*, Vol. 5 No. 1, pp. 1–4.
- Anifa, M., Ramakrishnan, S., Joghee, S., Kabiraj, S., & Bishnoi, M. M. (2022). "Fintech Innovations in the Financial Service Industry", *Journal of Risk and Financial Management*, Vol 15 No. 7, p. 287.
- Ashrafi, D. M., & Easmin, R. (2022). "Okay Google, Good to Talk to You... Examining the Determinants Affecting Users' Behavioral Intention for Adopting Voice Assistants: Does Technology Self-Efficacy Matter?", International Journal of Innovation and Technology Management, p. 2350004.
- Ashrafi, D. M., Alam, I., & Anzum, M. (2021). "An Empirical Investigation of Consumers' Intention for Using Ride-Sharing Applications: Does Perceived Risk Matter?", *International Journal of Innovation and Technology Management*, Vol. 18 No. 8, p. 2150040.
- Ashrafi, D. M., Habiba, W., & Alam, I. (2020). "An assessment of the behavioural intention for using ride-sharing services: Empirical evidence from a developing country", *Malaysian Journal of Consumer and Family Economics*, Vol. 24 No. 1, pp. 36-62.
- Ashrafi, D. M., Zannat, N. E., Easmin, R., & Dovash, R. H. (2022). "Understanding the drivers of passengers' intention to engage in digital multi-sided ridesharing platforms: Moderating impact of openness to experience and perceived risk", *Malaysian Journal of Consumer and Family Economics*, Vol. 29, pp. 305-351.
- Arner, D.W., Barberis, J. & Buckley, R.P. (2015), "The Evolution of FinTech: A New Post-Crisis Paradigm", *Georgetown Journal of International Law*, Vol. 47, available at: https://heinonline.org/HOL/Page?handle=hein.journals/geojintl47&id=1282&div=&collection= (accessed 30 May 2021).
- Bharati, P. & Chaudhury, A. (2004), "An empirical investigation of decision-making satisfaction in webbased decision support systems", *Decision Support Systems*, North-Holland, Vol. 37 No. 2, pp. 187– 197.
- Chang, H.H. & Wong, K.H. (2010), "Adoption of e-procurement and participation of e-marketplace on firm performance: Trust as a moderator", *Information & Management*, North-Holland, Vol. 47 No. 5–6, pp. 262–270.
- Chen, C.S. (2013), "Perceived risk, usage frequency of mobile banking services", *Managing Service Quality*, Emerald Group Publishing Limited, Vol. 23 No. 5, pp. 410–436.
- Chin, W.W. (1998), "Issues and opinion on structural equation modeling.", *MIS Quarterly* 22, Vol. 22 No. 1, pp. vii–xvi.
- Cortina, J.J. & Schmukler, S.L. (2018), *The Fintech Revolution: A Threat to Global Banking*?, available at: http://remittanceprices.worldbank.org. (accessed 30 May 2021).

- DeLone, W.H. & McLean, E.R. (1992), "Information systems success: The quest for the dependent variable", *Information Systems Research*, INFORMS Inst.for Operations Res.and the Management Sciences, Vol. 3 No. 1, pp. 60–95.
- DeLone, W.H. & McLean, E.R. (2003), "The DeLone and McLean model of information systems success: A ten-year update", *Journal of Management Information Systems*, Vol. 19, M.E. Sharpe Inc., pp. 9–30.
- Demirgüç-Kunt, A., Kane, E. and Laeven, L. (2015), "Deposit insurance around the world: A comprehensive analysis and database", *Journal of Financial Stability*, Elsevier, Vol. 20, pp. 155–183.
- Deng, X. & Cheng, X. (2019), "Can ESG indices improve the enterprises' stock market performance?-An empirical study from China", *Sustainability (Switzerland)*, MDPI AG, Vol. 11 No. 17, p. 4765.
- Ernst and Young. (2015), "EY Landscaping UK Fintech.", UK Trade & Investment, pp. 1-20.
- Featherman, M.S. & Pavlou, P.A. (2003), "Predicting e-services adoption: A perceived risk facets perspective", *International Journal of Human Computer Studies*, Academic Press, Vol. 59 No. 4, pp. 451–474.
- Fornell, C. & Larcker, D.F. (1981), "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error", *Journal of Marketing Research*, SAGE Publications, Vol. 18 No. 1, pp. 39–50.
- Forsythe, S., Liu, C., Shannon, D. & Gardner, L.C. (2006), "Development of a scale to measure the perceived benefits and risks of online shopping", *Journal of Interactive Marketing*, Elsevier Inc., Vol. 20 No. 2, pp. 55–75.
- Forsythe, S.M. & Shi, B. (2003), "Consumer patronage and risk perceptions in Internet shopping", Journal of Business Research, Elsevier, Vol. 56 No. 11, pp. 867–875.
- Gao, L. & Waechter, K.A. (2017), "Examining the role of initial trust in user adoption of mobile payment services: an empirical investigation", *Information Systems Frontiers*, Springer New York LLC, Vol. 19 No. 3, pp. 525–548.
- Gefen, D., Straub, D. & Boudreau, M.-C. (2000), "Structural Equation Modeling and Regression: Guidelines for Research Practice", *Communications of the Association for Information Systems*, Association for Information Systems, Vol. 4 No. 1, p. 7.
- Gefen, D. & Straub, D.W. (1997), "Gender differences in the perception and use of e-mail: An extension to the technology acceptance model", *MIS Quarterly: Management Information Systems*, University of Minnesota, Vol. 21 No. 4, pp. 389–400.
- Gomber, P., Kauffman, R.J., Parker, C. & Weber, B.W. (2018), "On the Fintech Revolution: Interpreting the Forces of Innovation, Disruption, and Transformation in Financial Services", *Journal of Management Information Systems*, Routledge, Vol. 35 No. 1, pp. 220–265.
- Groß, M. (2016), "Impediments to mobile shopping continued usage intention: A trust-risk-relationship", *Journal of Retailing and Consumer Services*, Elsevier Ltd, Vol. 33, pp. 109–119.
- Gulamhuseinwala, I., Bull, T. & Lewis, S. (2015), "FinTech is Gaining Traction and Young, High-Income Users are the Early Adopters", 7 November, available at: https://papers.ssrn.com/abstract=3083976 (accessed 30 May 2021).
- Harrison McKnight, D., Choudhury, V. and Kacmar, C. (2002), "The impact of initial consumer trust on intentions to transact with a web site: A trust building model", *Journal of Strategic Information Systems*, North-Holland, Vol. 11 No. 3–4, pp. 297–323.
- Henseler, J., Ringle, C.M. & Sarstedt, M. (2014), "A new criterion for assessing discriminant validity in variance-based structural equation modeling", *Journal of the Academy of Marketing Science 2014* 43:1, Springer, Vol. 43 No. 1, pp. 115–135.
- Hsieh, M.T. & Tsao, W.C. (2014), "Reducing perceived online shopping risk to enhance loyalty: A website quality perspective", *Journal of Risk Research*, Routledge, Vol. 17 No. 2, pp. 241–261.
- Hsu, M.H., Chang, C.M., Chu, K.K. & Lee, Y.J. (2014), "Determinants of repurchase intention in online group-buying: The perspectives of DeLone & McLean is success model and trust", *Computers in Human Behavior*, Elsevier Ltd, Vol. 36, pp. 234–245.

- Iwashita, N. (2022). "Why fintech is not changing Japanese banking", *Asian Economic Policy Review*, pp. 1-14
- Kaur, G., Habibi Lashkari, Z., & Habibi Lashkari, A. (2021). "Introduction to FinTech and Importance Objects". *Understanding Cybersecurity Management in FinTech*, pp. 1-15. Springer, Cham.
- Kaur, S. & Arora, S. (2020), "Role of perceived risk in online banking and its impact on behavioral intention: trust as a moderator", *Journal of Asia Business Studies*, Emerald Publishing Limited, Vol. 15 No. 1, pp. 1–30.
- Khalilzadeh, J., Ozturk, A.B. & Bilgihan, A. (2017), "Security-related factors in extended UTAUT model for NFC based mobile payment in the restaurant industry", *Computers in Human Behavior*, Pergamon, Vol. 70, pp. 460–474.
- Kim, C., Tao, W., Shin, N. & Kim, K.S. (2010), "An empirical study of customers' perceptions of security and trust in e-payment systems", *Electronic Commerce Research and Applications*, Elsevier, Vol. 9 No. 1, pp. 84–95.
- Kim, D.J., Ferrin, D.L. & Rao, H.R. (2008), "A trust-based consumer decision-making model in electronic commerce: The role of trust, perceived risk, and their antecedents", *Decision Support Systems*, North-Holland, Vol. 44 No. 2, pp. 544–564.
- Kock, N. (2015), "Common Method Bias in PLS-SEM", *International Journal of E-Collaboration*, IGI Global PUB759 Hershey, PA, USA, Vol. 11 No. 4, pp. 1–10.
- Kuo Chuen, D.L. & Teo, E.G.S. (2015), "Emergence of FinTech and the LASIC principles", *Journal of Financial Perspectives*, EY Global FS Institute, Vol. 3 No. 3, pp. 24–36.
- L. Zavolokina Mateusz Dolata, G.S. (2016), "Fintech-What's in a Name", In Proceedings of the 37th International Conference on Information Systems, pp. 1–19.
- Lee, D.K.C. & Teo, E.G.S. (2015), "Emergence of FinTech and the LASIC Principles", 7 November, available at: https://papers.ssrn.com/abstract=3084048 (accessed 30 May 2021).
- Lee, K.C. & Chung, N. (2009), "Understanding factors affecting trust in and satisfaction with mobile banking in Korea: A modified DeLone and McLean's model perspective", *Interacting with Computers*, Oxford Academic, Vol. 21 No. 5–6, pp. 385–392.
- Lee, M.C. (2009), "Factors influencing the adoption of internet banking: An integration of TAM and TPB with perceived risk and perceived benefit", *Electronic Commerce Research and Applications*, Elsevier, Vol. 8 No. 3, pp. 130–141.
- Lee, S.G., Chae, S.H. & Cho, K.M. (2013), "Drivers and inhibitors of SaaS adoption in Korea", *International Journal of Information Management*, Elsevier Ltd, Vol. 33 No. 3, pp. 429–440.
- Lim, N. (2003), "Consumers' perceived risk: Sources versus consequences", *Electronic Commerce Research and Applications*, Vol. 2, Elsevier, pp. 216–228.
- Luo, X., Li, H., Zhang, J. & Shim, J.P. (2010), "Examining multi-dimensional trust and multi-faceted risk in initial acceptance of emerging technologies: An empirical study of mobile banking services", *Decision Support Systems*, North-Holland, Vol. 49 No. 2, pp. 222–234.
- Marriott, H.R. & Williams, M.D. (2018), "Exploring consumers perceived risk and trust for mobile shopping: A theoretical framework and empirical study", *Journal of Retailing and Consumer Services*, Elsevier Ltd, Vol. 42, pp. 133–146.
- Mayer, R.C., Davis, J.H. & Schoorman, F.D. (1995), "An Integrative Model of Organizational Trust", *The Academy of Management Review*, The Academy of Management, Vol. 20 No. 3, p. 709.
- McKnight, D.H., Lankton, N.K., Nicolaou, A. & Price, J. (2017), "Distinguishing the effects of B2B information quality, system quality, and service outcome quality on trust and distrust", *Journal of Strategic Information Systems*, Elsevier B.V., Vol. 26 No. 2, pp. 118–141.
- Mitchell, V. (1999), "Consumer perceived risk: conceptualisations and models", *European Journal of Marketing*, Emerald, Vol. 33 No. 1/2, pp. 163–195.
- Namahoot, K.S. & Laohavichien, T. (2018), "Assessing the intentions to use internet banking: The role of perceived risk and trust as mediating factors", *International Journal of Bank Marketing*, Emerald Group Publishing Ltd., Vol. 36 No. 2, pp. 256–276.
- Nicolaou, A.I. & McKnight, D.H. (2006), "Perceived information quality in data exchanges: Effects on

risk, trust, and intention to use", *Information Systems Research*, INFORMS Inst.for Operations Res.and the Management Sciences, Vol. 17 No. 4, pp. 332–351.

- Oliveira, T., Faria, M., Thomas, M.A. & Popovič, A. (2014), "Extending the understanding of mobile banking adoption: When UTAUT meets TTF and ITM", *International Journal of Information Management*, Elsevier Ltd, Vol. 34 No. 5, pp. 689–703.
- Pavlou, P.A. (2003), "Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model", *International Journal of Electronic Commerce*, M.E. Sharpe Inc., Vol. 7 No. 3, pp. 101–134.
- Pavlou, P.A. & Gefen, D. (2004), "Building effective online marketplaces with institution-based trust", *Information Systems Research*, INFORMS Inst.for Operations Res.and the Management Sciences, Vol. 15 No. 1, available at:https://doi.org/10.1287/isre.1040.0015.
- Petter, S., DeLone, W. & McLean, E. (2008), "Measuring information systems success: Models, dimensions, measures, and interrelationships", *European Journal of Information Systems*, Palgrave Macmillan Ltd., Vol. 17 No. 3, pp. 236–263.
- Piccolo, R., Papa, A., Scuotto, V., & Del Giudice, M. (2022). "How digital transformation connects knowledge exploration and exploitation with business model innovation: A fintech perspective". *Digital Transformation Management*, pp. 38-56. Routledge.
- Podsakoff, Philip M., MacKenzie, Scott B., Lee, Jeong-Yeon, & Podsakoff, N.P. (2003), "Common method biases in behavioral research: A critical review of the literature and recommended remedies", *Journal of Applied Psychology*, Vol. 88 No. 5, pp. 879–903.
- Pratono, A.H. (2018), "From social network to firm performance: The mediating effect of trust, selling capability and pricing capability", *Management Research Review*, Emerald Group Publishing Ltd., Vol. 41 No. 6, pp. 680–700.
- Ryu, H.S. (2018), "What makes users willing or hesitant to use Fintech?: the moderating effect of user type", *Industrial Management and Data Systems*, Emerald Group Publishing Ltd., Vol. 118 No. 3, pp. 541–569.
- Sharma, S.K. & Sharma, M. (2019), "Examining the role of trust and quality dimensions in the actual usage of mobile banking services: An empirical investigation", *International Journal of Information Management*, Elsevier Ltd, Vol. 44, pp. 65–75.
- Shin, Y.J. & Choi, Y. (2019), "Feasibility of the fintech industry as an innovation platform for sustainable economic growth in Korea", *Sustainability (Switzerland)*, MDPI AG, Vol. 11 No. 19, p. 5351.
- Slade, E.L., Dwivedi, Y.K., Piercy, N.C. & Williams, M.D. (2015), "Modeling Consumers' Adoption Intentions of Remote Mobile Payments in the United Kingdom: Extending UTAUT with Innovativeness, Risk, and Trust", *Psychology and Marketing*, Wiley-Liss Inc., Vol. 32 No. 8, pp. 860–873.
- Sobehart, J.R. (n.d.). "The FinTech revolution: Quantifying earnings uncertainty and credit risk in competitive business environments with disruptive technologies", Henry Stewart Publications.
- Sobel, M.E. (1982), "Asymptotic Confidence Intervals for Indirect Effects in Structural Equation Models", *Sociological Methodology*, JSTOR, Vol. 13, p. 290.
- Song, H.L. (2010), "Customer adoption of internet banking: An integration of TAM with trust, perceived risk, and quality", *Proceedings 2010 2nd International Conference on Multimedia Information Networking and Security, MINES 2010*, pp. 264–268.
- Stewart, H. & Jürjens, J. (2018), "Data security and consumer trust in FinTech innovation in Germany", *Information and Computer Security*, Emerald Group Publishing Ltd., Vol. 26 No. 1, pp. 109–128.
- Straub, D., Boudreau, M.-C., Gefen, D., Straub, D.;, Boudreau, M.-C., Straub, D., Boudreau, M., et al. (2004), "Validation Guidelines for IS Positivist Research", Communications of the Association for Information Systems, Vol. 13, pp. 380–427.
- Teo, T., Lee, C.B. & Chai, C.S. (2008), "Understanding pre-service teachers' computer attitudes: applying and extending the technology acceptance model", *Journal of Computer Assisted Learning*, John Wiley & Sons, Ltd, Vol. 24 No. 2, pp. 128–143.
- Thomas Dapp, A.F. & Lars Slomka, E. (2014), Aktuelle Themen Digitale Ökonomie Und Struktureller
Wandel Hier Geht Es Zu Teil 2 Der Studie Fintech-Die Digitale (R)Evolution Im Finanzsektor Algorithmenbasiertes Banking Mit Human Touch, available at: www.dbresearch.de (accessed 30 May 2021).

- Tingchi Liu, M., Brock, J.L., Cheng Shi, G., Chu, R. & Tseng, T.H. (2013), "Perceived benefits, perceived risk, and trust: Influences on consumers' group buying behaviour", *Asia Pacific Journal of Marketing and Logistics*, Emerald Group Publishing Ltd., Vol. 25 No. 2, pp. 225–248.
- Venkatesh, V., Morris, M.G., Davis, G.B. & Davis, F.D. (2003), "User acceptance of information technology: Toward a unified view", *MIS Quarterly: Management Information Systems*, Management Information Systems Research Center, Vol. 27 No. 3, pp. 425–478.
- Wang, E.S.T. & Lin, R.L. (2017), "Perceived quality factors of location-based apps on trust, perceived privacy risk, and continuous usage intention", *Behaviour and Information Technology*, Taylor and Francis Ltd., Vol. 36 No. 1, pp. 2–10.
- Wang, W.T., Wang, Y.S. and Liu, E.R. (2016), "The stickiness intention of group-buying websites: The integration of the commitment-trust theory and e-commerce success model", *Information and Management*, Elsevier B.V., Vol. 53 No. 5, pp. 625–642.
- Wang, Y.S. (2008), "Assessing e-commerce systems success: A respecification and validation of the DeLone and McLean model of IS success", *Information Systems Journal*, John Wiley & Sons, Ltd, Vol. 18 No. 5, pp. 529–557.
- Wu, C.C., Huang, Y. & Hsu, C.L. (2014), "Benevolence trust: A key determinant of user continuance use of online social networks", *Information Systems and E-Business Management*, Springer Verlag, Vol. 12 No. 2, pp. 189–211.
- Xin, H., Techatassanasoontorn, A. & Tan, F.B. (2013), "Exploring the influence of trust on mobile payment adoption", Association for Information Systems (AIS), available at: https://openrepository.aut.ac.nz/handle/10292/5475 (accessed 6 August 2021).
- Xu, J.D., Benbasat, I. & Cenfetelli, R.T. (2013), "Integrating service quality with system and information quality: An empirical test in the E-service context", *MIS Quarterly: Management Information Systems*, University of Minnesota, Vol. 37 No. 3, pp. 777–794.
- Xu, Q. (2022). "East Asia and East Africa: Different Ways to Digitalize Payments", *Digitalization and Firm Performance*, pp. 219-249. Palgrave Macmillan, Cham.
- Yan, C., Siddik, A. B., Akter, N., & Dong, Q. (2021). "Factors influencing the adoption intention of using mobile financial service during the COVID-19 pandemic: the role of FinTech". *Environmental Science and Pollution Research*, pp. 1-19.
- Yan, H. & Pan, K. (2015), "Examining mobile payment user adoption from the perspective of trust transfer", *International Journal of Networking and Virtual Organisations*, Inderscience Publishers.
- Yang, S. (2016), "Role of transfer-based and performance-based cues on initial trust in mobile shopping services: a cross-environment perspective", *Information Systems and E-Business Management*, Springer Verlag, Vol. 14 No. 1, pp. 47–70.
- Zheng, Y., Zhao, K. & Stylianou, A. (2013), "The impacts of information quality and system quality on users' continuance intention in information-exchange virtual communities: An empirical investigation", *Decision Support Systems*, North-Holland, Vol. 56 No. 1, pp. 513–524.
- Zhou, T. (2012), "Understanding users' initial trust in mobile banking: An elaboration likelihood perspective", *Computers in Human Behavior*, Pergamon, Vol. 28 No. 4, pp. 1518–1525.
- Zhou, T. (2013), "An empirical examination of continuance intention of mobile payment services", *Decision Support Systems*, North-Holland, Vol. 54 No. 2, pp. 1085–1091.

CIRCULAR ECONOMY AND THE PORTUGUESE HOTEL INDUSTRY – AWARENESS, ATTITUDE, AND IMPACT ON THE ORGANISATIONAL PERFORMANCE

Berta José Fernandes Costa, Susana Cristina Serrano Fernandes Rodrigues, Carina Soares da Silva, and Maria Pilar Moreno Pacheco

Recieved February 8th, 2022; First Revision March 25th, 2022; Second Revision May 9th, 2022; Third Revision May 19th; Accepted May 27th, 2022

ABSTRACT

The Portuguese hotel industry is one of the tourism sectors that has been successfully thriving in the last decades. It has evolved to one of the best ranked sectorial areas with a very consistent growth pattern in the economic, social, and cultural spheres. For a great many years, the environmental impact of activity-based tourism, with an analogous expansion, has been ignored by the industry's economic drivers and such approach along with climate change as well as with the depletion of natural resources, have led to a set of serious social, environmental, and cultural constrains.

In this regard, implementing the concept of Circular Economy (CE) in the hotel industry stands out as a more appropriate economic model considering the current demand for guaranteeing resource conservation and environmental protection.

Susana Rodrigues (corresponding author) has a PhD degree in Strategic Management, from the University of Wolverhampton in the United Kingdom. She has been a Lecturer at the Polytechnic of Leiria, Portugal mainly in the areas of Strategic Management, Advanced Strategic Management, Trends and Business Opportunities, Marketing of New Products and Entrepreneurship and Innovation. She has been developing research on Circular Economy and is an author of a book on the subject. She is a member of the Centre of Applied Research in Management and Economics. Her research interests are within the field of business strategy, business failure, entrepreneurship and innovation, cocreation of innovation, and circular economy.

Carina Silva, has a PhD in Probability and Statistics, by the University of Lisbon obtained in 2012. She is a Professor in the Exact Sciences, Life, Social and Human Department of School of Health and Technology of Lisbon, Polytechnic of Lisbon, where she coordinates a post-graduation program in Health Data Science. She graduated from Faculty of Sciences of University of Lisbon in Statistics and Operational Research and holds a MSc in Probability and Statistics from the Faculty of Sciences of University of Sciences of University of Lisbon. She lectures in the areas of Biostatistics and applied Mathematics. Her main research interests are statistics in genetics, cybersecurity, and data science. She is a senior researcher at the Center of Applied Statistics from the University of Lisbon.

Pilar Moreno Pacheco, PhD in Economics, she is an Associate Professor at University of Seville and Vice-Dean of Faculty of Tourism and Finance. She is a visiting researcher at Mid Sweden University and Universidad Nacional Autónoma de México, and a member of the research group "SMEs and economic development". Her academic interests within the field of tourism and hospitality are market segmentation, innovation, SMEs and information and communication technologies.

Berta Costa is currently attending a PhD in Tourism, in the Faculty of Tourism and Finance - University of Seville-Spain. She has a M.A. in Portuguese and English, and she graduated in Languages and Modern Literatures – Portuguese and English Studies, at the Faculty of Arts and Humanities of the University of Coimbra, Portugal, in 1997. She is an Assistant Lecturer at School of Tourism and Maritime Technology - Polytechnic of Leiria – Portugal, in the areas of Tourism, Tourism and Recreation, and Catering and Restaurant Management. She is a researcher at CITUR (Centre for Tourism Research, Development and Innovation) since 2018. Her research comprises a wide range of topics within circular economy, sustainability, and tourism.

Little research on CE on the hotel industry in Portugal has been performed. To address this gap a quantitative research based on an online questionnaire was carried out among 78 Portuguese hotels, to examine their level of awareness, attitude and correlation with the companies' organisational performance. From the data collection analysis that was conducted it can be concluded that there is awareness regarding the Circular Economy concept and its principles. The results also reveal that hotels already implement some CE principles and put into practice several and different initiatives which impact on their organisational performance.

Through the implementation of CE principles, the Portuguese hotel industry can promote and strengthen their own businesses and conceive more sustained experiences for all the hotel industry parties involved.

Keywords: Circular Economy, Portuguese hotel industry, economic model, awareness, organizational performance, attitude

INTRODUCTION

The tourism sector and consequently the hotel industry are key for social and economic development of countries (Muñoz and Navia, 2015), as they are some of the fastest growing industries. Besides all the economic benefits conveyed by these sectors, tourism related activities also put a lot of pressure on the environment, as most of them rely on nature to be performed, and put the metabolism of tourist areas at risk, especially on account of waste generation, overuse of local resources, and also of the countless infrastructures necessary to address all the tourists' needs.

Consequently, it is imperative to rethink the values of travel and tourism sector, its purpose, business models, value chains, and skills so that it can operate within the planetary boundaries, guaranteeing contemporary generations and those to come welfare and proper standards of living. Therefore, the transition to a new travel and tourism paradigm is mandatory and Circular Economy stands out as an attractive concept, which offers a range of instruments that may allow the industry's long-term viability and sustainability.

The aim of this study is to examine the Portuguese hotel industry CE awareness level, attitude regarding the implementation of a CE paradigm, and its correlation with the organisational performance of hotels. Its purpose is to contribute to the academic research concerning CE within the Portuguese hotel industry, which requires further research as it has been vaguely examined, and additionally, fill in a research gap regarding the implementation of CE within the hotel industry.

After the introduction, Section 2 describes the state of the art regarding the concept of Circular Economy, CE awareness, attitude, and organisational performance. Methodology used for conducting the research is explored in Section 3 where the data collection and the data analysis procedures are displayed. Section 4 presents the results and discussion of the main findings; and finally, Section 5 exhibits the main conclusions of this research where future research implications as well as limitations are described.

LITERATURE REVIEW

The concept of Circular Economy

The concept of Circular Economy has been given increased attention within the last decades, yet it is not a new construct. Its origin has been extensively discussed and is not usually credited to a single author as several have researched and worked on it.

CIRCULAR ECONOMY AND THE PORTUGUESE HOTEL INDUSTRY

Ghisellini et al. (2016), Geissdoerfer et al. (2017), and Rodriguez et al. (2020) consider that the CE concept was first presented to the academic circle by Pearce and Turner (1990) as a means to minimize natural resources depletion and promote resource preservation in a sustainable manner.

Furthermore, Yang and Feng (2008), Geng and Doberstein (2008), and Hu et al. (2011) propose CE as a contemporary economic model based on a closed-loop design system which maintains products in utilisation for the most valuable period of time, so that value retention is preserved. It also mirrors the ecological closed materials systems in which the output of a process is the input of another and advocates the effective utilization of natural resources in order to achieve economic growth and development (Braungart et al., 2002; Ellen MacArthur Foundation (EMF), 2012; Pheifer, 2017). CE is also understood as an approach that considers the elimination of waste and the maximization of the value of materials (EMF, 2013; European Commission (EC), 2015; Waste Resources Action Programme (WRAP), 2016). The EMF (2013) considers this approach as being "restorative and regenerative by design", highlighting systems thinking and the urgency to shape the negative externalities.

In addition, Braungart et al. (2002) and the EMF (2012) also approach the 'eco-effectiveness' concept as a design-oriented system, with the purpose of minimizing and dematerializing products flow systems, allowing a continuous interchanging between economy and environment, at the expense of the 'eco-efficiency' approach in the prevailing production and consumption model.

Geissdoerfer et al. (2017) perspective Circular Economy as a regenerative economic model in which natural resources utilisation and waste, along with energy consumption and loss could be minimised by resorting to material and energy narrower loops. This could be accomplished through the redesign (long-lasting products), and the 5R-Principles (repair, reuse, remanufacture, refurbish and recycle).

Kirchherr et al. (2017) argue that the concept of CE accounts for an economic model that acts at three different levels (micro, meso and macro), as it would enable companies and consumers to preferably replace the end-of-life approach towards products by reusing, recycling and recovering materials from production and consumption operations. This would allow them to attain sustainable development goals, which presupposes economic welfare, environmental sustainability and social equity.

In conclusion, CE stands out as an innovative and alternative economic model as it enables the efficient management of natural resources, preserving their value and utility for extended periods of time. It allows the deceleration of raw materials utilisation which will ultimately and indirectly production performance and waste emissions, hallmarks of the linear economy (Stahel, 2019).

Circular Economy awareness, attitude, and organisational performance

In spite of CE growing popularity, limited implementation has been accomplished so far, mainly due to the fact that literature on this concept is predominantly theoretical or conceptual, and not very often empirically based (Linder and Williander, 2017; Ormazabal et al., 2018), which means that the transition to CE is still in a pre-development stage and distant from a worldwide level of implementation (Mayer et al., 2018; Donner and de Vries, 2020; Ghisellini and Ulgiati, 2020; Towa et al., 2021).

The perception of stakeholders' **awareness** on the CE concept is essential to allow the transition to a more sustainable society. In this view, van Langen et al. (2021) examined perceptions and awareness on this concept from a general and societal standpoint and concluded that research literature analysing and assessing awareness focus largely on individual actors, namely consumers and companies, overlooking stakeholders, policy makers and academicians and on the perspective of adopting CE in practices instead of focusing on its management.

Consumer's awareness on CE goes beyond the recycling R-Principles, and waste prevention in detriment of waste treatment has also been perceived as an effective tool to address the existing environmental challenges, mitigate the consumption footprint and enable material circularity rate (Jaca et

al., 2018; Diddi and Yan, 2019; De Koch et al., 2020; Genovese and Pansera, 2020; Giampietro and Funtowicz, 2020; Laitala et al., 2021; van Langen et al., 2021).

Considering the results of a survey widespread in the south of Poland, Smol et al. (2018) identified a high level of CE awareness. The results indicate that younger population is more aware of the CE concept and also of waste separation, and consider the acquisition of recycled and remanufactured products. However, respondents indicated that the purchase of these type of products is only put into practice when they are cheaper or have guarantee. The results also showed a correlation of this level of awareness with the level of education of the survey participants, position also considered by van Langen et al. (2021) who also identified position at work and companies' entrepreneurial culture as factors that influence awareness concerning CE. Nevertheless, this is a vaguely researched topic which should be the focus of greater attention and investigation.

Masi et al. (2018) and Liakos et al. (2019) stated that in Europe manufacturing companies are progressively becoming more aware of the CE concept, with Spain showing a high level of awareness as almost half of the participants in a survey on a sample of small and medium enterprises (SMEs) recognised that they are acquainted with this concept, whether from the internet, the social and corporate media, news, relatives, or from educational sources. In this case CE awareness is related to supplies, resource recovery, and reducing costs, which indicates that the implementation of CE does not stand as a priority to SMEs mainly as a result of a limited budget, the lack of a long-term vision coupled with time constrains. For these companies the transition and implementing CE is still a risky and costly process (Eurobarometer, 2016; Ormazabal et al., 2018; Cristoni and Tonelli, 2018).

With respect to stakeholders' **attitude** towards CE, the adoption of certain practices is gaining attention in the hotel industry. There are hotels that are already committed to environmental initiatives such as energy consumption and CO_2 emissions, the control of water flows to reduce water consumption. Concerning energy, used renewable energy sources such as thermal, geothermal and biomass produced energy have been introduced, along with natural gas (Vourdaubas, 2016; Alonso-Almeida et al., 2017). Regarding water consumption, hotels have already installed water control systems and introduced water retention and storing systems for gardening, mainly in destinations where there is water scarcity or where it is a costly resource (Alonso-Almeida et al., 2012; Fernández-Robin et al., 2019). As regards to waste, which hotels produce in large quantities, implementing CE R-Principles would extensively contribute to circular tourism as less resources are exploited and consequently wasted (Florido et al., 2019).

The implementation of the CE R-Principles have ultimately contributed to the emergence of 'green hotels' (Teng and Chang, 2014; Rahman and Reynolds, 2016; Winans et al., 2017). These businesses recognise that embracing 'green management' strategies allows them to reduce expenses, customer engagement and employee commitment, and also achieve short term operational goals (Chen, 2008). Customers are becoming increasingly aware of environmental constrains and are willing to pay for products and services that stand out as alternative and environmentally friendly solutions, and hotels have shown willingness to adopt them, as in the long term they will bring them recognition. Nevertheless, the introduction of these eco-friendly innovations stand out as excellent initial steps towards circularity, but they are not sufficient.

The hotel industry has been shifting towards circularity by adopting a number of sustainable practices to mitigate the use of waste materials in the construction sector along with secondary raw materials. This sector has enabled the design for dismantling which allows buildings to be flexible enough so that components and products may be reused; it has made possible the utilisation of non-hazardous building materials; the optimisation of cooperation along the supply chain; and the utilisation of clean technologies concerning the contents of the construction materials used (Florido et al., 2019). Research indicates that the hotel industry has endeavoured for strategies in the quest for sustainability in its three

dimensions – social, environmental and economic, as well as the reduction of the impact of its activities on the environment (Rodríguez-Antón and Alonso-Almeida, 2019).

Contemporary research on the Circular Economy concept shows that its impact on the **organisational performance** of companies is not yet fully investigated. As a result, the lack of strategies to monitor the implementation of CE stands out as a challenge to its implementation. Organisational performance is a complex and multifaceted concept that is hard to comprehend and measure. Rodrigues (2002) and Armstrong (2006) interpret performance indicators as metrics used to assess companies' performance and to evaluate its degree of effectiveness, which are used to determine goals and to establish parallels between competing companies or the industry standards.

Consequently, different companies have distinct performance goals which vary according to the company's objectives, the timeframe considered, the guidelines used, and the perspective-taking. Popova and Treur (2005), and Popova and Sharpanskykh (2011) consider customer satisfaction, customer loyalty, safety, and business results, which indicates that measuring customers' satisfaction and comprehending it is a significant element in improving companies' quality, which may lead to a business performance improvement, and ultimately to an enhancement of economic performance, whereas Mittal et al. (2019) regard skill mapping, as it enables performance trends recognition, and to map the employees' skills to allow them to endure in the company. Nevertheless, while establishing the primary performance indicators and goals to attain the wished performance, the company must relate these indicators to each other, as in the end some may prove to be incompatible.

The existing research on key performance indicators in the hotel industry focus largely on financial and non-financial indicators, including the study of measurement systems redesign (Onuferová et al., 2020; Jogovic et al., 2022). Concern regarding the fact that the hotel industry continues to rely on traditional metrics that are commonly associated with lack of accuracy, impartiality, and short-term orientation, has arisen among stakeholders, as performance measurements that include the quality of service and customer satisfaction are of extreme importance when it comes to improving business performance (Ahmad et al., 2019).

Odar et al. (2012), Pereira-Moliner (2015), Bacik et al. (2020) consider that the hotel size, the property system and rating have major importance when choosing metrics. Implementing key performance indicators in small hotels is different of implementing those in big hotels, with smaller ones not always implementing performance metrics or just downsizing them to financial analysis to reduce costs. Regarding larger hotels, the implementation of the appropriate metrics allows them to save costs, manage resources effectively and improve the service quality. Pereira-Moliner (2015) demonstrates that bigger hotels that implement non-financial metrics obtain better performance levels, which has a stronger impact on the market.

As research on the organisational performance of companies that have implemented CE is scarce and highly unexplored, to assess the hotels organizational performance the following indicators were considered: customers, carbon footprint/gas emissions/ greenhouse gas effects, improve profitability decrease, new competencies, new markets and consumers, access to raw materials, customer satisfaction, and overall performance increase.

A circular economic model cannot be implemented by single businesses or stakeholders, but by entrusting in large scale economic, social, and political transformations, which should embrace changes in legislation, production and consumption patterns, and manufacturing networks (Manniche et al., 2021).

METHODOLOGY

Data collection procedures

This study adopted a quantitative research approach by means of an online questionnaire, applied to the hotel industry in Portugal, in order to examine CE awareness, attitude and its impact on the organisational performance of companies. The target group of this study was the one under the classification of 'Hotels', which is the categorization chosen to perform the study, among the different denominations available at the visitportugal.com site, platform of the *Turismo de Portugal*. This questionnaire successfully reached 1407 hotels distributed by the different Portuguese regions considered by that entity, namely Porto and North region, Centre of Portugal, Lisbon region, Alentejo, Algarve, Madeira, and Azores. This questionnaire was made available online between 16th of April 2021 and 7th of July 2021, and the respondents accessed it through a link disseminated via email to the hotels emails available at the visitportugal.com site. Groups of hoteliers and hotel CEOs were also contacted via social media, namely through *LinkedIn*, and a follow up by telephone was made to obtain a higher response rate. Nevertheless, of the collected questionnaires only 78 were usable. Due to the fact that during this period Portugal was in total lockdown, with hotels and borders closed to tourism, the sample collected ended up being a convenience sample.

The questionnaire included 20 questions, divided by eight sections displayed in Table1, however, to perform this study only the Awareness, Attitude, and Organisational Performance dimensions were considered. Single-item as well as multiple-item scale were used to measure awareness, attitude and organisational performance of the CE construct within the participant group, rated from low to high, presenting the negative pole on the left and the positive one on the right. The present study aims to examine and evaluate the level of awareness and attitude regarding the implementation of Circular Economy in the Portuguese hotel industry and its impact on the organisational performance of companies by answering the following research questions:

- a) Is the Portuguese hotel industry aware of the concept of Circular Economy?
- b) Is the Portuguese hotel industry implementing Circular Economy?
- c) Is there a relationship between the hotel industry CE implementation and the organizational performance?

Data analysis procedures

Descriptive statistics were used to examine response variability and missing data in the questionnaires. A reliability analysis (internal consistency) was performed using Cronbach's alpha (α), as it indicates the extent to which surveys items can be treated as a single latent construct. Values >0.7 reliability is considered adequate for a survey instrument (Bland and Altman, 1997), although some authors consider >0.6 adequate (Field, 2000). For the entire survey, Cronbach's should be at least 0.9 (Bland and Altman, 1997). However, the validity of this measure has been questioned, and several authors have suggested alternative measures. In this study, the average inter-item correlation (AIIC) was also used, which is independent of the number of items and sample size. This measure evaluates how items within a composite correlate, i.e., there is evidence that the items are measuring the same underlying composite. A rule-of-thumb is that AIIC should be between 0.15 and 0.5 (Clark and Watson, 1995).

CIRCULAR ECONOMY AND THE PORTUGUESE HOTEL INDUSTRY

Dimension (ID: Identificator of the Construct)	Total	α	AIIC
Circular Economy Awareness (CE-A)	13	0.994	0.529
CE Measures Awareness (CE-M)	6	0.91	0.641
CE Attitude (CE-At)	13	0.946	0.54
CE Initiatives (CE-I)	8	0.905	0.547
CE and organisational performance (CE-OP)	8	0.913	0.574
CE Challenges (CE-C)	17	0.914	0.378
CE Enablers (CE-E)	11	0.904	0.462
CE Benefits (CE-B)	5	0.823	0.487
Total	81	0.97	0.281

Table 1 – Internal consistency statistics.

Construct item response-proportions were presented as positive responses, where in the constructs Circular Economy *Awareness;* Circular Economy *Attitude*; and Circular Economy and the *Organizational Performance*, it was considered positive who answered 3 or higher in the 5-point Likert scale. In the constructs Circular Economy *Initiatives* it was considered positive who answered 4 or higher in the 5-point Likert scale.

To analyze the relationship between the hotel implementation of CE and organizational performance it was conducted a correlation analysis, presented in section 4. From the questionnaire, 5 dimensions related to Circular Economy were considered, which are described in Table 2. It was calculated a global score that represents each Circular Economy construct obtained by the mean of the items that compose each construct. The scores range between 1 and 5, where high values are related to a positive behavior.

Reliability analyses (internal consistency), using Cronbach's alpha (α) and average inter-item correlation (AIIC) were performed on the 5 constructs to ensure that individuals were responding consistently to the items (Table 1), and an internal consistency was obtained, which means that the questionnaire has a good overall consistency.

Dimension (ID of the item	Items	Total	Score ID
profile)			
Circular Economy	Reduce	13	Score_CE-A
Awareness (CE-A)	Reuse		
	Recycle		
	Redesign		
	Rethink		
	Refurbish		
	Remanufacture		
	Repair		
	Repurpose		
	Recover		
	Refuse		
	Return		
	Re-Educate		
CE	Reduce gas emissions	6	Score_CE-
Measures Awareness (CE-M)	Clean energies		М
	Water management		

Table 2 - Constructs of the questionnaire related to Circular Economy and the corresponding items.

	Waste management		
	Responsible materials		
	CE measures not financed		
CE Attitude (CE-At)	Reduce	13	Score CE-
	Reuse		At
	Recycle		
	Redesign (Cradle-to-Cradle; Long Lasting Products)		
	Rethink		
	Refurbish		
	Remanufacture		
	Repair		
	Repurpose		
	Recover		
	Refuse		
	Return		
	Re-Educate		
CE Initiatives (CE-I)	The emissions generated	8	Score_CE-I
	The consumption of renewable or clean energies		
	Energy efficiency improvements		
	Water management		
	Waste management		
	The purchase of products designed according to		
	Circular Economy principles		
	The use of environmentally sustainable materials		
	Environmental conservation		
CE and organisational	More customers	8	Score_CE-
performance (CE-OP)	The reduction of carbon		OP
	Improve profitability		
	Acquire new competencies		
	Access to new markets and consumers		
	To have better access to raw materials		
	Increases customer satisfaction		
	Increases overall performance in the long term.		

The analysis of the open-ended questions was made by resorting to a content analysis and visually represented in charts.

RESULTS AND DISCUSSION

This section answers the research questions displayed in Section 3 and provides the discussion of the main results from the quantitative approach analysis.

Respondents' profile

The questionnaire respondents comprehended hotel managers, general managers, hotel CEOs, hotel directors and owners. Of the total number of questionnaires 3.9% of the hotels were from the Azores region, 5.8% from Madeira, 8.7% from the Algarve, 9.7% from Alentejo, 16.5% were from Porto and North region, 25.2% were from the Lisbon region, and 30.1% from the Centre of Portugal. With respect to the accommodation stars, the results show that 1.1% were one-star hotels, 11.5% referred to two-star hotels, 29.9% were three-star hotels, 51.7% four-star hotels, and 5.7% corresponded to five-star hotels. Concerning the hotel scope, the results show that 96.7% correspond to national companies, and 3.3% to international companies. With respect to the hotels type, 66.3% are independent accommodations, and 33.7% are part of a hotel chain.

CE Awareness

The questionnaire respondents were asked to identify all the CE R-Principles they are aware of, using the Likert scale, from 1-Not at all aware, to 5-Extremely aware. In this analysis only the positive distribution (3-Moderately aware, 4-Very aware, and 5-Extremely aware) was considered.

The results are summarised and presented in Figure 1. The respondents are largely aware of the CE R-Principles, ranking as highly important Recycle (98.72%), Reuse (97.44%), Reduce (97.44%), and Repair (96.15%), and aware of the remaining R-Principles considered as they were also highly classified: Rethink (57.69%), Redesign (56.41%), Refurbish (56.41%), Remanufacture (55.13%), and Refurbish (52.56%). These results indicate that the group of participants is aware of the CE R-Principles, mainly Recycle, Reuse, Reduce and Repair. Although the results demonstrate a great level of awareness regarding the remaining R-Principles their effective implementation has been reduced so far. Researchers believe that this is explained by the fact that the CE construct has mainly been explored from a conceptual or theoretical point of view, and scarcely ever from an empirical standpoint (Linder and Williander, 2017; Ormazabal et al., 2018), and lack evidence on its real and practical effectiveness.



Figure 1. Levels of awareness concerning the Circular Economy R-Principles in the Portuguese hotel sector.

The respondents were also asked to rank their level of awareness regarding measures that would promote the use of environmentally responsible materials, waste management, and water management, as well as measures that reduce carbon footprint/ CO_2 emissions/ greenhouse gas emissions, and those which assist the implementation of Circular Economy that are not financed by the government. A Likert scale was used, from 1-Not at all aware, to 5-Extremely aware. Figure 2 displays the results obtained from the analysis of the positive distribution (3-Moderately aware, 4-Very aware, and 5-Extremely aware). The findings indicate that the respondents are familiar with the aforementioned measures and especially with those that involve the use of environmentally responsible materials, waste management, and water management (97.44%). Similarly, the remaining measures are all well-known to respondents as figures vary from 94.87% (measures that promote the use of renewable or clean energies) and 87.18% (assist the implementation of measures that enable Circular Economy and that are not financed by the government). These measures are commonly put into practice as a means to cut costs and also because customers are increasingly aware of and demand the use of environmentally friendly materials and strategies, as

indicated by previous research (European Environmental Agency, 2016; Masi et al., 2017; Rizos et al., 2017).



Figure 2. Measures that stimulate the implementation of a Circular Economy model.

CE Attitude

Respondents were asked to rank the following R-Principles their companies are implementing using a Likert scale, from 1-Without implementation, to 5-Fully implemented. The results displayed by Figure 3 represent the positive distribution (3-Moderately aware, 4-Very aware, and 5-Extremely aware). It stands out that Repair (100%), Recycle (98.65%), Reduce (97.30%), and Reuse (90.50%) are being strongly implemented, whereas, Remanufacture (50%), Return (51.35%), Refuse (52.70%), Redesign and Rethink (54.05%), and Refurbish (55.41%) are the least implemented. The 3R-Principle (Reduce, Reuse, Recycle) along with Repair emerge as a procedure to protect natural environment and resources, to improve their utilization, and finally to promote sustainability. It also enables the possibility of extending the life span of products by repairing or maintaining a faulty product so it can be used in performing its original function. Yang et al. (2014), also argued that it also assists the transition from a linear economic paradigm to a circular one, and that the inclusion of Reuse was of importance so that a closed loop within the circular economy business model can be achieved. Geng et al. (2019) argue that products should be planned and designed to be recyclable and reusable, produced by resorting to clean manufacturing methods and distributed by green supply chains, so that value is created.

This 3R strategy is often used in the context of the travel and tourism industry and its applicability is centralised in the energy, water, and waste efficiency areas, by reducing their emissions and consequently lead to an environmental performance improvement and are in conformity with the survey results (Ioannidis et al., 2011). These results are also evidence that CE may still be understood as the Reduce, Reuse and Recycle approach as described in previous research (Kirchherr, 2017). Nevertheless, the reutilisation of products and/or its parts along with life-cycle perspectives are acquiring importance (Fonseca et al., 2018).



Figure 3. Circular Economy R-Principles implemented by the participant hotels.

Respondents were also asked, in an open-ended question, to explain how they are implementing CE R-Principles in their companies if the question above was ranked 3-Moderately implemented or above. The results were analysed and converted into Figure 4. It shows that 58.6% of the respondents ranked recycling and water management as the most significant measures adopted; followed by energy management (55.1%), and cleaning management (37.9%). With the lowest values the respondents ranked renewable energies (3.4%), products design (3.4%), products refurbish (3.4%), products reuse (3.4%), greenhouses (3.4%) and water reusing systems (3.4%).



Circular Economy - Attitude - Initiatives hotels are implementing

Figure 4. Initiatives the participants are implementing.

These results indicate that it is imperative to use resources wisely, recycling waste, reducing the consumption of water and energy and produce the minimum waste possible. This allows the reduction expenses at the operating level, as water and energy consumption levels are high, but also to be in line with the European Green Deal agreement that establishes carbon neutrality by 2050 (Costa, 2021; Dani et al., 2021). Companies can also benefit from the potential that recycling offers as it allows to reduce the

amount of waste that needs to be handled or disposed of, which reduces environmental impact (Manniche et al, 2021). Programmes concerning cleaning management and towel and bed linen are also very well received by an increasing number of visitors that demand sustainable alternatives (Manniche et al., 2021).

The questionnaire respondents also ranked which initiatives their companies taking into account, using a Likert scale from 1-Strongly disagree, to 5-Strongly agree. Figure 5 displays the results obtained from the positive distribution (4-Agree, and 5-Strongly agree). Around 97.22% of the respondents referred that their companies are implementing water management policies; 94.44% ranked energy efficiency improvements, and 72.22% prioritised waste management strategies. However, only 31.94% of the respondents considered the purchase of products designed according to Circular Economy principles.

These results indicate that companies have been putting into practice CE management strategies, as recycling, water and energy management as well as cleaning management practices, education and training of their workers regarding more sustainable procedures, and towel and bed linen programmes, as described in literature (Manniche et al., 2017; Ioannidis, et al.,2021). These strategies can ultimately result in a reduction of their consumption and emissions, improve the companies' environmental performance, and above all it allows them to decrease the operating costs by reducing water and energy costs (Dani et al., 2021). As previous research indicates these results are a clear strategic option put into practice by companies, as it allows them to save costs (economic outcome) and to pollute less and with a minor impact (environmental outcome) (European Environmental Agency, 2016; Masi et al., 2017; Rizos et al., 2017).



Figure 5. Hotels' initiatives.

CE and the Organisational Performance

This questionnaire respondents were invited to state the predictive positive impact of the implementation of CE Principles on the organisational performance of their companies, using a Likert scale, from 1-Strongly disagree, to 5-Strongly agree. The results displayed in Figure 6 were obtained from the positive distribution (3-Neither agree or disagree, 4-Agree, and 5-Strongly agree).

The participants considered that acquire new competencies (96.61%), the reduction of carbon footprint/ greenhouse gas effects (90.28%) are top predictive positive impacts on the performance of hotels, followed by an increase in the overall performance of the companies (84.72%), an increase in customer satisfaction (84.72%), and access to new markets and consumers (84.72%). These results show

CIRCULAR ECONOMY AND THE PORTUGUESE HOTEL INDUSTRY

that the responses are in harmony with the following key premises established by the Roadmap for Carbon Neutrality 2050 (RNC 2050)-the long-term strategy for carbon neutrality of the Portuguese economy by 2050. These premisses may allow the increasing number of visitors searching for sustainable alternatives in the hotel industry to see their demands accomplished, allowing access to new markets and consumers (Circular Economy Action Plan, 2020; Dani et al., 2021). These results are also consistent with the conclusions from previous studies (European Environment Agency, 2016; Rizos, 2017; Masi, 2017).



Figure 6. CE Predictive positive impact on the organisational performance.

CE Awareness, Attitude and Organisational Performance – Correlation analysis

So as to scrutinise the relation between the Accommodation profile (hotels' *region*, *number of stars*, *type of company*, and *hotel scope*) and Awareness, Attitude, and companies Organisational Performance, a correlation analysis was conducted, and the results are displayed as follows.

CE Awareness and the Accommodation Profile

Regarding CE *Awareness* by *Region*, it is observable that the region of Lisbon obtained the highest mean score (3.9), as displayed by Figure 7. These findings indicate the Lisbon region has unique and unmatched conditions that allow the creation and development of value proposition. It offers attractive tourism core products (nature tourism, water-sports tourism, religious tourism, health and wellbeing, along with other diverse factors) that stimulate regional development and also a specific capacity to generate wealth and create jobs, which exerts a domino effect on the Portuguese economy (ERT, Lisboa, 2015).



Figure 8 displays the results regarding Awareness in correlation with the Number of Stars, it is possible to conclude that five-star hotels are more aware of the CE concept, with the highest mean score (3.9).



Figure 8. CE Awareness by Number of Stars.

Considering the Awareness dimension and its correlation with the Hotel Type, independent accommodation or part of a hotel chain, Figure 9 shows that hotels that are part of hotel chains are more aware of the concept of CE, with the highest mean score (3.6).



Figure 9. CE Awareness by Hotel Type.

Figure 10 indicates that with respect to *Awareness* regarding the CE concept relatively to the *Hotel Scope*, it is observable that International Companies are more aware, as this dimension obtained the highest mean score (4.0).



Figure 10. CE Awareness by Hotel Scope.

Based on the evidence it was found that Portuguese hotels with higher star category show a higher level of innovation, as the implementation of a circular paradigm. They also have to be consistent with specific technical requirements, they also have the tendency to be bigger and often part of international hotel chains, which allows the access to other sort of resources, knowledge, and to profiting from economies of scales that can enhance the implementation of innovative measures, results which are in line with previous research (Orfila-Sintes and Mattsson, 2009).

CE Attitude and the hotel Accommodation Profile

Regarding the correlation between CE *Attitude* and the *Region*, it has been found that the Lisbon region attained the highest mean score (3.8), as indicated by Figure 11.



Figure 11. CE Attitude by Region.

Figure 12 displays the *Attitude* dimension in correlation with the hotels *Number of Stars*, and it indicates that five-star hotels have a more proactive attitude regarding the implementation of the CE R-Principles, as they obtained the highest mean score (3.8).



Figure 12. CE Attitude by Number of Stars.

By analysing the *Attitude* dimension and its correlation with the *Hotel Type*, Figure 13, independent accommodation or part of a hotel chain, hotels that are part of hotel chains are more committed to the CE R-Principles implementation as they gathered the highest mean score (3.4).



Figure 13. CE Attitude by Hotel Type.



Figure 14. CE Attitude by Hotel Scope.

As regards the Attitude dimension and its correlation with the Hotel Scope, it is possible to conclude that both groups have very similar attitudes regarding the implementation of the CE R-

Principles, as the means attained by these two categories are very close with international companies obtaining the highest score (3.2), as indicated by Figure 14.

These results indicate that costumers are currently more aware and more informed concerning environmental sustainability, and they believe businesses also have the responsibility for positive change and that brands and governments should promote the transition. These customers are also willing to pay more when commitments to protect nature and environment are provided, and expect that services and practices adopted by certain hotels are replicated by those that are part of the same chain or brand worldwide. These results are consistent with previous studies that show that environmental conscious customers are more willing to purchasing eco-friendly products and services despite their higher costs (Laroche et al., 2001; Martinez et al., 2019). Environmental factors are playing an increasingly more significant role in the tourism industry, with numerous companies implementing environmental certifications programmes (Lee et al., 2017; Chung, 2020).

CE Awareness and CE Organisational Performance

In this section a correlation analysis between each pair of items of the dimension (*Organisational Performance* and CE *Awareness*, CE *Measures*, CE *Attitude*, and CE *Initiatives*) is displayed. Kendal's tau-b correlation coefficient was used (ranging between -1 and 1, values less than + or - 0.10: very weak; + or - 0.10 to 0.19: weak; + or - 0.20 to 0.29: moderate; + or - 0.30 or above: strong). To facilitate the analysis, since there were several coefficients obtained, they are exhibited together in a Heatmap plot, which is a graphical representation of data that uses a system of dark-to-light colour scale to represent different values.

A correlation analysis between dimension *CE Awareness* (CE-A) and the *CE Organisational Performance* (CE-OP) is presented in Figure 15. It is observable that the Kendal's tau-b coefficients ranged between 0.001 and 0.466. The highest values were obtained between *Refurbish* (CE-A) and *To have better access to raw materials* (CE-OP) (Tau-b = 0.466); and *Reuse* (CE-A) and *The reduction of carbon footprint* (CE-OP) (Tau-b = 0.463). The items *The reduction of carbon footprint* (CE-OP) and *To have better access to raw materials* (CE-OP) obtained moderate to strong values between all items of CE-Awareness.

Hotels are aware of the Refurbish R-Principle (CE Awareness dimension) and its correlation with the performance of the company. The results show that refurbish stands out as a new form to have access to raw materials (CE Organisational Performance), to already existing materials that are salvaged and reused, which end up in a final product comparable to a new one. Refurbishing a product means restoring a used product and update it. It means upgrading and/or modernising the purpose of a product. Generally, it does not include disassembly, but parts of a multi-component product are replaced or repaired whereas the whole structure remains intact, and its implementation allows the retention of products and their parts across the economy for longer periods of time, while preserving or enhancing their value, which allows companies to reduce costs, manage waste and preserve resources (Reike et al., 2018; Corselette, 2020).

Reuse is defined as a product second or additional use that is still in perfect condition and still fulfils its primary function by a different user or owner, which means that a reused product maintains its function and singularity (Jayaraman, 2006). Reuse also stands out as a strategy that allows hotels to reduce the carbon footprint of their companies (CE Organisational Performance), close production loops, it promotes the efficient use of natural resources as well as products value retention, and ultimately reduce production costs, which is consistent with previous research (Reike et al., 2018; Fonseca et al., 2018; Morseletto, 2020).



CE Measures and CE Organisational Performance

Figure 15. Heatmap plot of Kendal's tau-b correlation coefficients between the *Awareness* dimension and the *Organisational Performance* of companies when considering a CE implementation.

Furthermore, a second correlation analysis between the CE *Measures* (CE-M) and the CE *Organisational Performance* dimension (CE-OP) that assist the implementation of that circular paradigm is considered in Figure 8. It is seen that Kendal's tau-b coefficients ranged between 0.138 and 0.493. The highest values were obtained between *Assist the implementation of measures to enable Circular Economy that are not financed by the government* (CE-M) and *The reduction of carbon footprint/ gas emissions/ greenhouse gas effects* (CE-OP) (Tau-b = 0.493), and *Promote waste management* (CE-M) and *Acquire new competencies* (CE-OP) (Tau-b = 0.463); and *Promote the use of environmentally responsible materials* (CE-M) and *Acquire new competencies* (CE-OP); and *Promote the use of environmentally responsible materials* (CE-M) and *Acquire new competencies* (CE-OP); and *Promote the use of environmentally responsible materials* (CE-M) and *Increases overall performance in the long term* (CE-OP) (Tau-b = 0.445) and (Tau-b = 0.442), respectively, achieved moderate to strong values.

			CE and organisational performance							
		More customers	The reduction of carbon lootprint/gas emissions/ greenhouse gas effects	Improve profitability	Acquire new competencies	Access to new markets and consumers	To have better access to raw materials	Increases customer satisfaction	Increases overall performance in the long term.	•3
	Reduce carbon footprint/ CO2 emissions / greenhouse gas emissions	0,260	0,417	0,296	0,286	0,269	0,290	0,339	0,248	
ser	Promote the use of renewable or clean energies	0,285	0,421	0,348	0,428	0.273	0,254	0,243	0.237	
Insi	Promote water management	0,299	0.279	0,250	0,365	0,266	0,138	0,342	0,321	
Aea	Promote waste management	0,311	0,379	0,335	0,463	0,272	0,225	0,370	0,423	
CEN	Promote the use of environmentally responsible materials	0,376	0,419	0,450	0,445	0,363	0,375	0,434	0,442	
	Assist the implementation of measures to enable Circular Economy that are not financed by the government	0,386	0.493	0.297	0,359	0,404	0,348	0,410	0,345	

Figure 16. Heatmap plot of Kendal's tau-b correlation coefficients between the *Measures* dimension and the *Organisational Performance* of companies when considering a CE implementation.

CIRCULAR ECONOMY AND THE PORTUGUESE HOTEL INDUSTRY

From the analysis of Figure 16 it is evident that hoteliers are aware of the measures that assist the implementation of strategies to enable Circular Economy that are not financed by the government (CE Measures dimension), mainly those that allow the reduction of the companies' carbon footprint (CE Organisational Performance). Companies do not await for governments support to implement measures that allow them to reduce CO2 emissions, or to manage their waste properly, they usually take the initiative and invest in new competencies. These results also show that the promotion of the use of sustainable materials and the efficient use of waste ought to be done by acquiring new skills and competencies, and in the future consider "waste as a resource" (Hollins et al., 2017:3) as reported by previous research (Kirchherr, 2017; Fonseca et al, 2018).

CE Attitude and CE Organisational Performance

A correlation analysis between the dimension CE *Attitude* (CE-At) and the CE *Organisational Performance* (CE-OP) is provided by Figure 17. Kendal's tau-b coefficients ranged between 0.106 and 0.564. The highest correlation coefficients were recorded between the item *Rethink* (CE-At) and *To have better access to raw materials* (CE-OP) (Tau-b = 0.564); and *Remanufacture* (CE-At) and *To have better access to raw materials* (CE-OP) (Tau-b = 0.529). The items *Refuse* (CE-At) and *To have better access to raw materials* (CE-OP) (Tau-b = 0.529). The items *Refuse* (CE-At) and *To have better access to raw materials* (CE-OP); and *Refuse* (CE-At) and *Improve profitability* (Tau-b = 0.515) and (Tau-b = 510), respectively, obtained moderate to strong values.

It is observable that the Rethink, Remanufacture, and Refuse (*CE Attitude* dimension), allow companies to reconsider their needs with the emphasis on how to reduce their environmental impact and on how to have better access to raw materials (*CE Organisational Performance*). Enhancing these R-Principles will ultimately decrease the use of natural resources and the need for new materials, mitigating the pressure on the environment, outcomes which are consistent with previous research (Masi et al., 2017; Rizos et al., 2017; Velenturf and Purnel, 2021).



Figure 17. Heatmap plot of Kendal's tau-b correlation coefficients between the *Attitude* dimension and the *Organisational Performance* of the participant Portuguese hotels.

CE Initiatives and CE Organisational Performance

A correlation analysis between the CE *Initiatives* (CE-I) and the CE *Organisational Performance* (CE-OP) is supplied by Figure 10. In this analysis the Kendal's tau-b coefficients ranged between 0.020 and 0.576. The highest correlation coefficients were between the item *The use of environmentally sustainable materials* (CE-I) and *Access to new markets and consumers* (CE-OP) (Tau-b = 0.576); and

the item *The use of environmentally sustainable materials* (CE-I) and *Improve profitability* (CE-OP) (Tau-b = 0.524). The items *The use of environmentally sustainable materials* (CE-I) and *Increases overall performance in the long term* (CE-OP) (Tau-b = 0.493); and *Environmental conservation* (CE-I) and *Improve profitability* (CE-OP) (Tau-b = 0.487) achieved moderate to strong coefficient values.

Figure 18 shows that respondents consider that the use of environmentally sustainable materials (CE *Initiatives* dimension) will allow them to enter and capture new markets and consumers (*Organisational Performance*). Presently consumers are aware that their consumption patterns are having a negative effect on the environment and that a revolutionary transformation urges. Nevertheless, sustainability and environmental negative externalities are not the drivers regarding consumption patterns, but are starting to figure between those commonly associated with consumption drivers along with products' prices, availability, usefulness, traditions, values, conventions and also peer pressure are the key factors when purchasing goods.



Figure 18. Heatmap plot of Kendal's tau-b correlation coefficients between the *Initiatives* dimension and the *Organisational Performance* of Portuguese hotels.

CONCLUSION

This study adds additional evidence to the already-existing literature on Circular Economy and the hotel industry, as it examined awareness, attitude, and their correlation with companies organisational performance. Besides the theoretical contribution, the results are important to stakeholders, policymakers, and also for researchers who act in the travel and tourism sector as well as the ones that operate in the hotel industry by assisting in better understanding the importance of the CE principles, develop strategies for its implementation foreseeing potential constrains and challenges, and simultaneously optimize not only the tangible benefits (profits and assets) but also the intangible ones (brand awareness, reputation, originality, synergy).

There is considerable published literature on Circular Economy and its potential to substantially enhance the use of natural resources, mitigate the production and consumption greenhouse gas emissions, and simultaneously allow companies to pursue competitive and advantageous business opportunities. However, little research and operational projects concerning the implementation of Circular Economy and its R-Principles in the Portuguese hotel industry have been conducted.

Nevertheless, the results of this research indicate that there is awareness among the participant companies relatively to the concept of CE and its R-Principles, with special emphasis on the 3R-Principles (Reduce,

CIRCULAR ECONOMY AND THE PORTUGUESE HOTEL INDUSTRY

Reuse, Recycle) along with Repair, which are the focus of this industry's environmental strategy holistic approach (Kirchherr, 2017; Fonseca et al., 2018; Ioannidis, et al., 2021). Nevertheless, recently emphasis has also been put on the other R-Principles, with shorter loop options that enable the highest retention value of natural resources through numerous life cycles (Reike et al., 2018).

In addition, emphasis on the promotion of the use of environmentally responsible materials, waste, energy, and water management, recycling, as well as cleaning management practices, on the education and training of their workers regarding more sustainable procedures, and towel and bed linen programmes are being considered.

The results also highlight that acquire new competencies, the reduction of carbon footprint/ greenhouse gas effects, as well as an increase in the overall performance of the companies and access to new markets and consumers comprise the predictive beneficial effects of a CE implementation on the performance of companies. These are in compliance with the European Green Deal (2019) that impelled a concerted strategy so that climate neutrality can be achieved by 2050 by promoting a climate-neutral, resource efficient economic model. To accomplish such goals, it is mandatory that the transition to a more regenerative economic model is accelerated, the consumption of natural resources is kept within the planetary boundaries, and follow a circular production and consumption pattern in the next decades. Regarding the correlation analysis performed between the *Awareness* and *Attitude* dimensions and all the items that compose the *Accommodation Profila* (region hotel number of stars hotel type and hotel

items that compose the *Accommodation Profile* (region, hotel number of stars, hotel type, and hotel scope), the main findings indicate that five-star hotels that belong to international hotel chains situated in the Lisbon region are more aware of the concept of Circular Economy and also put into practice some CE R-Principles, pursuing a more proactive attitude.

Reducing the exhaustion of raw materials by refurbishing products and production and consumption systems is a key strategy to a more circular economy, and that the decoupling of economic growth from resource use, may allow companies to benefit from a sustainable supply of these materials. The results also show that companies are focused on the Reuse R-Principle which allows to balance the demand and supply of natural resources. The life span of a product can be expanded through Reuse, which means that its value would be kept for longer periods of time and their ecological impact minimised (EMF, 2015; Korhonen et al., 2018).

Hotel managers are conscious of strategies that enable the implementation of a Circular Economy model by implementing strategies/ measures that allow the hotel industry to reduce its carbon footprint is not an easy task, and the lack of awareness, along with the lack of initiative and support, and also the risks of the investment may put that implementation at risk (Chan, 2021). Hoteliers acknowledge that they are part of the solution to decarbonisation, and that it can generate benefits by reducing the operational costs. Increased awareness regarding environmental issues is modifying companies' corporate responsibility and also customers' expectations and accelerating companies response to climate emergency.

The use of environmentally sustainable products is thought to be one of the initiatives that may enable companies to have access to new markets and consumers, and ultimately to increase profitability. Currently, numerous companies have started to label themselves as being environmentally friendly and to offer products and services that have a smaller impact on the environment and provide benefits to customers. Others have also adopted the concept of cleaner production, a new and preventive strategy that enables resources, product, services and processes efficiency, reducing the threats to environment and people (Bai et al., 2015), so that consumers' needs, and demands are met in an ecological manner by mitigating pollutants and preserving natural resources (Hojnik, et al., 2019).

The present research contributes to the debate in the hotel industry to further engage, comprehend and emphasise strategies for improving the implementation of Circular Economy in the hotel industry. A thorough understanding of the present evolution of the Circular Economy concept may allow companies to differentiate their strategies and gain competitive advantages. Similarly, an examination of the present research and on the companies' awareness and attitude insights may play a meaningful role in the implementation of Circular Economy.

Although, the goals proposed in this study were reached, there are some points that ought to be enhanced or considered on related future research. The size of the sample considered to this research is a constraint feature as it does not allow the generalisation of the results to the Portuguese hotel industry. For this reason, future research on this domain can build on the results displayed by engaging a larger number of companies. Additionally, this study has the potential to be applied in other countries and extend the research by considering the social, economic, and environmental pillars in a Circular Economy implementation, as well as consider the assessment of hotels organisational performance subsequently to the implementation of Circular Economy R-Principles and practices. Future research may also comprise the analysis of customers' satisfaction regarding CE implementation.

REFERENCES

- Ahmad, Z., Ahmad, N., & Papastathopoulos, A. (2019). Measuring Service Quality and Customer Satisfaction of the Small- and Medium-Sized Hotels (SMSHs) Industry: Lessons from United Arab Emirates (UAE). Tourism Review, 74(3): 349–370.
- Alonso-Almeida, M. (2012). Water and Waste Management in the Moroccan Tourism Industry: The Case of Three Women Entrepreneurs. Women's Studies International Forum 35: 343–353.
- Alonso-Almeida, M., Robin, F., Pedroche, C., & Astorga, S. (2017). Revisiting Green Practices in the Hotel Industry: a Comparison between Mature and Emerging Destinations. J. Clean. Prod. 140: 1415–1428.
- Armstrong, M. (2006). *Performance Management Key strategies and Practical Guidelines*. Kogan Page Limited. London and Philadelphia.
- Bacik, R., Fedorko, R., Gavurova, B., Ivankova, V., & Rigelsky, M. (2020). Differences in Financial Performance between Various Categories of Hotels in the Visegrad Group Countries. Journal of International Studies, 13(2): 279–29
- Bai, Y., Yin, J., Yuan, Y., Guo, Y., & Song, D. (2015). An Innovative System for Promoting Cleaner Production: Mandatory Cleaner Production Audits in China. Journal of Cleaner Production, 108: 883–890.
- Bland, A. & Altman, G. (1997). Statistics Notes: Cronbach's Alpha. British Medical Journal. 314-572.
- Braungart & McDonough, (2002). Cradle to Cradle Remaking the Way we Make Things. North Point Press. New York.
- Chan, W. (2021). *Why do Hotels Find Reducing their Carbon Footprint Difficult?* International Journal of Contemporary Hospitality Management, 33 (5): 1646-1667.
- Chen, S. (2008). *The driver of Green Innovation and Green Image Green Core Competence*. Journal of Business Ethics. 81: 531-543.
- Chung, K. (2020). Green Marketing Orientation: Achieving Sustainable Development in Green Hotel Management. Journal of Hospitality Marketing & Management, 29: 6, 722-738.
- *Circular Economy Action Plan for a More Cleaner and More Competitive Europe.* (2020). European Commission. In

https://ec.europa.eu/environment/pdf/circulareconomy/new_circular_economy_action_plan.pdf

- Clark, A. & Watson, D. (1995). Constructing Validity: Basic Issues in Objective Scale Development. Psychological Assessment, 7(3):309.
- Costa, C. (2021). The Impact of COVID-19 Outbreak on the Tourism and Travel Sectors in Portugal: Recommendations for Maximising the Contribution of the European Regional Development Fund (ERDF) and the Cohesion Fund (CF) to the Recovery. European Commission.

- Cristoni, N. & Tonelli, M. (2018). *Perception of Firms Participating in a Circular Economy*. European Journal of Sustainable Development 7 (4): 105-118.
- Dani, R., Tiwari, K., & Negi, P. (2021). *Ecological Approach Towards Sustainability in Hotel Industry*. Materials today: Proceedings 46:

- De Kock, L., Sadan, Z., Arp, R., & Upadhyaya, P. (2020). A Circular Economy Response to Plastic Pollution: Current Policy Landscape and Consumer Perception. South Afr. J. Sci. 116 (5/6): 2.
- Diddi, S. & Yan, R.-N. (2019). Consumer Perceptions Related to Clothing Repair and Community Mending Events: a Circular Economy Perspective. Sustainability 11 (5306):1–17.
- Donner, M. & de Vries, H. (2020). *How to Innovate Business Models for a Circular BioEconomy?* Business Strategy and the Environment.
- Ellen MacArthur Foundation. (2012). *Towards the Circular Economy*. Vol. 1: Economic and Business rationale for a Circular Economy. Ellen MacArthur Foundation.
- Ellen MacArthur Foundation. (2013). *Towards the Circular Economy*. Vol. 2: Opportunities for the consumer goods sector. Ellen MacArthur Foundation.
- Ellen MacArthur Foundation. (2015). Delivering the Circular Economy. A Toolkit for Policymakers. Cowes, UK.
- ERT Lisboa. (2015). Plano Estratégico para o Turismo da Região de Lisboa (2015-2019). In
- https://www.turismodeportugal.pt/SiteCollectionDocuments/estrategia/Estrategias-Regionais-

Lisboa/Plano-Estrategico-Turismo-Lisboa-2015-2019.pdf

- Eurobarometer. (2016). *Flash Eurobarometer* 441. In https://data.europa.eu/data/datasets/s2110 441 eng?locale=en
- European Environmental Agency. (2016). *Circular Economy in Europe. Developing the Knowledge Base*. European Environmental Agency: Copenhagen, Denmark.
- European Green Deal. (2019). European Commission. Available at https://ec.europa.eu/environment/pdf/circulareconomy/new_circular_economy_action_plan.pdf
- Fernández-Robin, C.; Celemín-Pedroche, S.; Santander-Astorga, P.; Alonso-Almeida, M. (2019). *Green Practices in Hospitality: A Contingency Approach*. Sustainability 11: 3737.
- Field, A. (2000). Discovering Statistics using SPSS for Windows. London: SAGE Publications.
- Florido, C., Jacob, M., & Payeras, M. (2019). *How to Carry out the Transition Towards a More Circular Tourist Activity in the Hotel Sector. The Role of Innovation.* Administrative Sciences, 9, 47.
- Fonseca, L., Domingues, J., Pereira, M., Martins, F., & Zimon, D. (2018). Assessment of Circular Economy within Portuguese Organisations. Sustainability, 10, 2521.
- Geissdoerfer, M., Svaget, P., Bocken, N., & Hultink, E. (2017). *The Circular Economy a New Sustainability Paradigm?* Journal of Cleaner Production, 143: 757-768.
- Geng, Y. & Doberstein, B. (2008). *Developing the Circular Economy in China: Challenges and Opportunities for Achieving "Leapfrog Development"*. The International Journal of Sustainable Development and World Ecology, 15: 231-239.
- Geng, Y., Sarkis, J., & Bleischwitz, R. (2019). *How to Globalize the Circular Economy*. Nature Comment. Institute for Sustainable Resources, 565: 153-155.
- Genovese, A. & Pansera, M. (2020). *The Circular Economy at a Crossroad: Technocratic Ecomodernism* or Convivial Technology for Social Revolution? Capitalism Nature Socialism 32:2, 95-113.
- Ghisellini, P., Cialani & C., Ulgiati, S. (2016). A Review on Circular Economy: the Expected Transition to a Balanced Interplay of Environmental and Economic Systems. Journal of Cleaner Production 114: 11–32.
- Ghisellini, P. & Ulgiati, S. (2020). *Managing the Transition to Circular Economy*. In: Brandão, M., Lazarevic, D., Finnveden, G. (Eds.), Handbook of the Circular Economy. Edward Elgar Publishing Ltd, UK, New York.
- Giampietro, M. & Funtowicz, O. (2020). From Elite Folk Science to the Policy Legend of the Circular Economy. Environmental Science and Pollution Research109: 64-72.

^{10439-10442.}

- Hojnik, J., Ruzzier, M., & Ruzzioer, K. (2019). Transition towards Sustainability: Adoption of Eco-Products Among Consumers. Sustainability, 11: 4308.
- Hollins, O., Lee, P., Sims, E., Bertham, O., Symington, H., Bell, N., Pfaltzgraff, L., & Sjogran, P. (2017). Towards a Circular Economy – Waste Management in the European Union.
- Hu, J., Xaio, Z., Deng, W., Wang, M., & Ma, S. (2011). *Ecological Utilization of Leather Tannery Waste* with Circular Economy Model. Journal of Cleaner Production, 19: 14-25.
- Ioannidis, A., Chalvatzis, K., Leonidou, L., & Zhiteng, F. (2021). *Applying the Reduce, Reuse and Recycle Principle in the Hospitality sector: its Antecedents and Performance Implications.* Business Strategy and the Environment. 3394-3410.
- Jaca, C., Prieto-Sandoval, V., Psomas, L., & Ormazabal, M. (2018). What Should Consumer Organizations do to Drive Environmental Sustainability? Journal of Cleaner Production 181: 201– 208.
- Jayaraman, V. (2006). Production Planning for Closed-Loop Supply Chains with Product Recovery and Reuse: an Analytical Approach. International Journal of Production Research 44(5): 981-998.
- Jugović, T., Štavljanin, V., & Stanković, M. (2022). Winter Destinations Hotels Performance Measurement Practice - Evidence from CEE. Economic ResearchEkonomska Istraživanja.
- Kirchherr, J., Reike, & D. Hekkert, M. (2017). Conceptualizing the Circular Economy: An Analysis of 114 Definitions. Resource Conservation 127: 221-232.
- Korhonen, J., Nuur, C., Feldmann, A., & Birkie, S. (2018). *Circular Economy as an Essentially Contested Concept.* Journal of Cleaner Production, 175: 544-552.
- Laitala, K., Klepp, G., Haugrønning, V., Throne-Holst, H., & Strandbakken, P. (2021). *Increasing Repair* of Household Appliances, Mobile Phones and Clothing: Experiences from Consumers and the Repair Industry. Journal of Cleaner Production 282.
- Laroche, M., Bergeron, J., & Barbaro-Forleo, G. (2001). *Targeting consumers who are willing to pay more for environmentally friendly products*. Journal of Consumer Marketing, 18(6): 503–520.
- Lee, M., Noh, Y., Choi, D., & Rha, S. (2017). Environmental Policy Performances for Sustainable Development: From the Perspective of ISO 14001 Certification. Corporate Social Responsibility & Environmental Management, 24: 108–120.
- Liakos, N., Kumar, V., Pongsakornrungsilp, S., Garza-Reyes, A., Gupta, B., & Pongsakornrung-silp, P. (2019). Understanding Circular Economy Awareness and Practices in Manufacturing Firms. Journal of Enterprise Information Management, 32(4): 563-584.
- Linder, M. & Williander, M. (2017). *Circular Business Model Innovation: Inherent Uncertainties*. Business Strategy and the Environment, 26(2): 182-196.
- Manniche, J., Topsoe, K., Rikke, L., & Broegaard, B. (2021). *The Circular Economy in Tourism: Transition Perspectives for Business and Research*. Scandinavian Journal of Hospitality and Tourism, 21:3, 247-264.
- Martínez P., Herrero, Á., & Gómez-López, R. (2019). Corporate Images and Customer Behavioral Intentions in an Environmentally Certified Context: Promoting Environmental Sustainability in the Hospitality Industry. Corporate Social Responsibility and Environmental Management 26:1382– 1391.
- Masi, D., Day, S., & Godsell, J. (2017). Supply Chain Configurations in the Circular Economy: a Systematic Literature Review. Sustainability 9, 1602.
- Masi, D., Kumar, V., Garza-Reyes, J., & Godsell, J. (2018). Towards a More Circular Economy: Exploring the Awareness, Practices, and Barriers from a Focal Firm Perspective. Prod. Plann. 29 (6): 539–550.
- Mayer, A., Haas, W., Wiedenhofer, D., Krausmann, F., Nuss, P., & Blengini, A. (2018). Measuring Progress Towards a Circular Economy. a Monitoring Framework for Economy-Wide Material Loop Closing in the EU28. J. Ind. Ecol. 1–15.
- Mittal, A., Dhiman, R., & Lamba, P. (2019). *Skill Mapping for Blue-Collar Employees and Organisational Performance*. Benchmarking: An International Journal 26.4: 1255–1274. Web.

- Morseletto, P. (2020). *Targets for a Circular Economy*. Resources, Conservation and Recycling. Volume 153: 104553.
- Muñoz, E. & Navia, R. (2015). Waste Management in Touristic Regions. Waste Management & Research, 33: 593–94
- Ness, D. (2008). Sustainable Urban Infrastructure in China: Towards a Factor 10 Improvement in Resource Productivity through Integrated Infrastructure System. International Journal of Sustainable Development and World Ecology 15: 228-301.
- Odar, M., Kavcic, S., & Jerman, M. (2012). *Performance Measurement Systems: Empirical Evidence from Slovenia*. Economic Research-Ekonomska Istrazivanja, 25(2): 445–464.
- Onuferová, E., Cabinová, V., Dzurov Vargová, T. (2020). Analysis of Modern Methods for Increasing and Managing the Financial Prosperity of Businesses in the Context of Performance: a Case Study of the Tourism Sector in Slovakia. Oeconomia Copernicana, 11(1): 95–116.
- Orfila-Sintes, F. & Mattsson, J. (2009). Innovation Behaviour in the Hotel Industry. Omega, 37(2), 380-394.
- Ormazabal, M., Prieto-Sandoval, V., Puga-Leal, R., & Jaca, C. (2018). *Circular Economy in Spanish AMEs: Challenges and Opportunities*. Journal of Cleaner Production, 185: 157-167.
- Pearce, D. & Turner, R. (1990). *Economics of Natural Resources and the Environment*. The John Hopkins University Press. Baltimore.
- Pereira-Moliner, J., Font, X., Tarí, J., Molina-Azorin, F., Lopez-Gamero, D., & Pertusa, E. (2015). The Holy Grail: Environmental Management, Competitive Advantage and Business Performance in the Spanish Hotel Industry. International Journal of Contemporary Hospitality Management, 27(5): 714–738.
- Popova V. & Treur J. (2005). A Specification Language for Organisational Performance Indicators. In: Ali M., Esposito F. (eds) Innovations in Applied Artificial Intelligence. IEA/AIE 2005. Lecture Notes in Computer Science, vol 3533. Springer, Berlin, Heidelberg.
- Popova, V. & Sharpansky, A. (2011). Formal Modelling of Organisational Goals based on Performance Indicators. Data & Knowledge Engineering. Volume 4: 335-364.
- Rahman, I. & Reynolds, D. (2016). Predicting Green Hotel Behavioural Intentions using a Theory of Environmental Commitment and Sacrifice for the Environment. Industrial Hospitality Management 52: 107-116.
- Reike, D., Vermeulen, W., & Witjes, S. (2018). The Circular Economy: New or Refurbished 3.0?-Exploring the Controversies in the Conceptualization of the Circular Economy through a Focus on History and Value Retention Options. Resources, Conservation and Recycling. Vol. 135: 246-264.
- Rizos, V., Behrens, A., Kafyeke, T., Hirschnitz-Garbers, & M., Ioannou, A. (2015). *The Circular Economy: Barriers and Opportunities for SMEs* (No. 412), CEPS Working Document. Centre for European Policy Studies (CEPS).
- Rizos, V., Tuokko, K., & Behrens, A. (2017). *The Circular Economy A Review of Definitions, Processes and Impacts*. Research Report. Thinking ahead for Europe. CEPS – Energy, Climate, House.
- Roadmap for Carbon Neutrality 2050 (RNC 2050)- the Long-Term Strategy for Carbon Neutrality of the
Portuguese Economy by 2015. (2019). In
https://www.portugal.gov.pt/downloadficheiros/ficheiro.aspx?v=%3D%3DBAAAAB%2BLCAAA
A AABACzMDexBAC4h9DRBAAAAA%3D%3D
- Rodrigues, S. (2002). Business Strategy and Organizational Performance: An Analysis of the Portuguese Mould Industry. Ph.D. Thesis, Universidade de Wolverhampton, West Midlands: UK.
- Rodríguez, C., Florido, C., & Jacob, M. (2020). Circular Economy Contributions to the Tourism Sector: A Critical Literature Review. Sustainability, 12: 4338.
- Rodríguez-Antón, J. & Alonso-Almeida, M. (2019). *The Circular Economy Strategy in Hospitality: A Multicase Approach*. Sustainability 11: 5665.
- Smol, M., Kulczycka, J., & Avdiushchenko, A. (2017). Circular Economy Indicators in Relation to Eco-Innovation in European Regions. Clean Technol. Environ. Policy19: 669-678.

Stahel, W. (2019). The Circular Economy: a User's Guide. Routledge. New York.

- Towa, E., Zeller, V., & Achten, J. (2021). Assessing the Circularity of Regions: Stakes of Trade of Waste for Treatment. Journal of Industrial Ecology, 25(4).
- Teng, C. & Chgang, H. (2014). Effects of Temporal Distance and Related Strategies on Enhancing Customer Participation Intention for Hotel Eco-Friendly Programs. International Journal of hospitality Management, volume 40: 92-99.
- Van Langen, S., Vassillo, C., Ghisellini, P., Restaino, D., Passaro, R., & Ulgiati, S. (2021). Promoting Circular Economy Transition: a Study about Perceptions and Awareness by Different Stakeholders Groups. Journal of Cleaner Production, 316.
- Velenturf, A. & Purnell, P. (2021). Principles for a Sustainable Circular Economy. Sustainable Production and Consumption 27: 1437-1457.
- Vourdoubas, J. (2016). Energy Consumption and Use of Renewable Energy Sources in Hotels: A case Study in Crete, Greece. Journal of Tourism Hospitality and Management 4: 75–87.
- Winans, K., Kendall, A. & Deng, H. (2017). *The History and Current Applications of the Circular Economy Concept*. Renewable and Sustainable Energy Reviews 68: 825-33.
- Yang, S. & Feng, N. (2008). A Case Study of Industrial Symbiosis: Nanning Sugar Co., Ltd in China. Resources, Conservation and Recycling, 52: 813-820.
- Yang, Z., Zhou, J. & Xu, K. (2014). A 3R Implementation Framework to Enable Circular Consumption in Community. International Journal of Environmental Science, 5(2): 217-222. Environmental Science and Development, 5(2): 217–222.

EXPLORING MINI-BUS TAXI ADVERTISING EFFECTS BASED ON THE THEORY OF HIERARCHY-OF-EFFECTS: A SOUTH AFRICAN COMMUTER PERSPECTIVE

Thérèse Roux and Suzanne Lamprecht

Received June 30th, 2022; First Revision August 10th, 2022; Second Revision August 17th, 2022; Accepted August 20th, 2022

ABSTRACT

The out-of-home advertising media class and in particular transit advertising have not received the attention they deserve in the literature. The study explores minibus taxi advertising effects, guided by the hierarchy-of-effects theory. For a theoretical basis, out-of-home advertising media and transit advertising are conceptualised, the hierarchy-of-effects model and hypotheses development are discussed. Interview administrated surveys with regular minibus taxi commuters at a large taxi rank in South Africa were used to collect data. Results revealed significant relationships on cognitive and affective response levels. In terms of behavioural responses, attention paid to advertising was significantly related to positive word of mouth but not to the buying of advertised products. Some practical recommendations are offered to activate commuters' responses on cognitive-affective and behavioural levels. Downstream advertising effects, such as word-of-mouth and increased sales can be enhanced by marketers using integrated multimedia campaigns.

Keywords: hierarchy-of-effects model, attention, exposure, attitudes, word-of-mouth

INTRODUCTION

Magna reports that global out-of-home (OOH) advertising media expenditure increased by +12% to \$27 billion at the end of 2021 (MAGNA global, 2022). This, however, only represented about 83% of the pre-COVID levels in 2019, attributable to diminished consumer mobility. This spending is predicted to increase by double digits in 2022 and 2023, resulting in the gradual recovery of this sector (MAGNA global, 2022). Similar patterns of slower and gradual recovery of OOH advertising were also observed in the South African OOH advertising market (Myburgh & Stuart, 2019). Conversely, while the global

Thérèse Roux (Corresponding author) is a full Professor in Marketing Management at the University of Technology, South Africa. Her general research focus is marketing communication media and alternative out-of-home media. She has published in the International Journal of Retail and Distribution Management, Journal of Global Marketing and Journal of Promotion Management, among others. She has extensive research- and marketing industry experience. Her past industry experience and enduring relationships allow her to conduct relevant and valuable research on alternative and contemporary media platforms.

Suzanne Lamprecht is currently a lecturer in the Faculty Management Sciences, Tshwane University of Technology, South Africa. She obtained her Master's degree in Marketing (Cum laude) in 2018 at the Tshwane University of Technology. She has more than 13 years lecturing experience in different areas of Marketing and Marketing Research. She has published in local and international journals such as the South African Journal of Communication Theory and Research.

advertised transit segment was particularly negatively affected (MAGNA global, 2022), spending on minibus taxi advertising in South Africa was not particularly negatively affected during this period. This is due to the minibus taxi being one of the few modes of transportation operating during the strict lockdown period in South Africa (Buthelezi, 2020; Primedia Outdoor, 2022). The primary focus of this paper is on minibus taxis, a specific transit advertising media type (Roux, Van Der Waldt & Ehlers, 2013), a part of the larger OOH advertising media class. Minibus taxi advertising refers to advertising displays affixed to the exterior of a minibus taxi.

The largely informal and unregulated minibus taxi industry of South Africa plays a central role in the public transport sector and the country's economy. Minibus taxis remain the dominant mode of public transport, representing 75% of all daily transport (Fobosi, 2021). The minibus taxi industry delivers 15 million commuter trips via 300 000 registered minibus taxis on South African roads (Department of Transport, 2019). The industry continues to expand, notwithstanding economic tumult and is estimated to be worth R50 billion per year, with more than 69% of households who commute (Molobela, 2021).

The recent systematic literature reviews by Wilson (2022) and Khang et al. (2016), of publications in major journals over several decades, concluded that OOH advertising media is one of the most under-researched areas within the advertising literature. This is despite being recognised as one of the oldest forms of communication and the most dynamic of all traditional media (Letang & Stillman, 2020). The focus of this study is on minibus taxi advertising, as a specific transit advertising media type within the OOH advertising media class (Roux, Van Der Waldt & Ehlers, 2013). Past OOH advertising media studies have focused predominantly on outdoor advertising or billboards (e.g. Bhargava & Donthu, 1999; Donthu, Cherian & Bhargava, 1993; Osborne & Coleman, 2008; Taylor, Franke & Bang, 2006; Wilson & Till, 2011; Woodside, 1990). Researchers have only lately commenced to examine alternative OOH advertising media platforms in the form of transit advertising campaigns (Ali & Safwan, 2019; Wilson, Lohmeier, Lustick & Chen, 2020); static transit advertising effectiveness at subways (Chan & Fung 2013), airports (Wilson & Till 2008) or mobile transit advertising effectiveness on busses (Ngan & Yang, 2019; Prendergast & Hang, 1999), taxi cabs (Veloutsou & O'Donnell, 2005) and branded motor vehicles (Roux, 2018), street-and-retail-furniture advertising (Cornelius, Natter & Faure, 2010; Lehmann & Shemwell, 2011) as well as place-based media (Roux & Maree, 2021; Suh, Wilson & On, 2021). These studies surely offer valuable insights into factors to consider when using these transit advertising types, but they have not investigated minibus taxi advertising effects in South Africa in terms of exposure, attention, attitudes and word of mouth. This apparent gap in the literature means that further research is needed. The study, therefore, aims to overcome this gap by exploring minibus taxi advertising effects based on the hierarchy-of-effects theory.

In the rest of the paper, OOH advertising media and transit advertising are conceptualised, whereafter the hierarchy-of-effects model used as a theoretical framework and hypotheses development are discussed. It then sets the research objectives and outlines the methods used to design the study and present the results. Finally, the paper provides conclusions, limitations, and areas for future research.

LITERATURE REVIEW

A conceptualisation of Transit Advertising as OOH Advertising Media

Different conceptualisations for OOH advertising media offered by scholars and industry associations can be found (Roux & Van der Waldt, 2014). For this article the definition of OOH advertising media by Wilson (2022) will be used namely: It is the "commercially OOH advertising available and physically rentable assets situated outside the home in both public and commercial places". The components of this definition are also applicable to minibus taxis advertising. i) Minibus taxi

advertising is located outside the home, unlike broadcast, print, and online media which are usually consumed inside the home or office. ii) These advertisements are placed on the minibus taxis' physical owners' assets in the form of vehicles. iii) The advertising offers exposure to media in public places, such as at minibus taxis ranks, transport hubs, or alongside streets. iv) This media is rentable, with a value exchange occurring between the advertiser and the owner of the physical asset. iv) Access to the physical asset must be commercially available, meaning most brands or organizations can rent space on the asset (Roux & Van der Waldt, 2014).

Transit advertising offers specific benefits. It allows cost effective delivery of messages to a large captive audience with a longer exposure (Veloutsou & O'Donnell, 2005). Audiences such as commuters waiting in line at minibus taxi ranks or inside transit media vehicles typically result in more time being available for people to notice and read the advertisement message more than once (Kazmi & Batra, 2009). It results in highly frequent exposure to the advertisements repeatedly over a longer period, because daily commuters' travelling routines are standard (Belch & Belch, 2020). There is flexibility, due to the variety of forms and intensities that can be placed outside or inside a variety of vehicles or transit environments. This offers advertisers the opportunity to place advertisements in locations where other outdoor advertising is often very expensive or prohibited (Veloutsou & O'Donnell, 2005:218).

Hierarchy-of-effects Model

This research is guided by the hierarchy-of-effects model as the theoretical framework. The hierarchy-of-effects model (Barry, 1987; Barry & Howard, 1990) has widely been used by academic scholars as well as practitioners to assess the effectiveness of advertising (Wijaya, 2015; Khang et al., 2016) and OOH advertising media (Wilson, 2022; Roux, 2016). Based on this model, consumers' responses to advertising are categorized and measured across three levels namely: cognitive, affective, and conative (Barry, 1987). This model can also be applied to OOH advertising media effects. Roux (2016), for example, found that advertising media practitioners in South Africa apply OOH advertising media to achieve different communication objectives across this three-tier hierarchy of response levels. This practice is aligned with global academic studies suggesting that OOH advertising can be effective to obtain cognitive responses from consumers (e.g. recall, attention, recognition or interest) (Bhargava, Donthu & Caron, 1994; Donthu, Cherian & Bhargava, 1993; Van Meurs & Aristoff, 2009), affective responses (e.g. attitudes, liking or conviction) (Veloutsou & O'Donnell, 2005) as well as behavioural responses (e.g., trial, purchase intention or actual purchase) (Alamanos, Brakus & Dennis, 2015; Bhargava & Donthu, 1999; Taylor & Franke, 2003; Taylor, Franke & Bang, 2006). Interestingly, Wilson's (2020) systematic review of OOH advertising, spanning 104 years, revealed that most of the articles published measured cognitive outcomes followed by affective outcomes. However less than 20% of articles assessed behavioral outcomes.

Hypotheses development

Figure 1 presents the conceptual framework of the study with four hypotheses relating to the correlation between key constructs measured on the three hierarchy of response levels. It indicates the key constructs relating to the effectiveness of minibus taxi advertising on a cognitive (exposure to minibus taxi advertising), affective (attitudes towards advertising) and conative level (positive word of mouth and buying of advertised products). The theory guiding the development on a conative level of the four hypotheses in this model is discussed in the following sections.

Exposure and attention

The opportunity to be exposed to a specific medium and subsequent noting or awareness of an advertising message has been used in past research to examine and estimate exposure to different types of OOH advertising media (Wilson & Till, 2008; Veloutsou & O'Donnell, 2005) and is thus also measured for minibus taxi advertising in this paper. The physical features of OOH advertising media such as large or unique sizes (Hutter, 2015; Wilson & Casper, 2016), placement and angle of the medium as well as competing stimuli in the environment (Wilson & Casper, 2016; Wilson & Suh, 2018) have been proven to influence exposure and directed attention (Donthu, Cherian & Bhargava, 1993; Wilson & Till, 2008). However, OOH advertising is viewed and processed in a complex environment, due to the moving nature of the media as well as limited time for processing by the audience (Donthu, Cherian, & Bhargava 1993), with factors such as high OOH advertising clutter and human density negatively affecting the directed attention (Wilson & Suh, 2018; Wilson & Till, 2008).



Figure 1 Conceptual model

Furthermore, the relations between exposure and cognitive responses such as attention, recall and recognition have been considered in other studies. Wilson and Till (2013), for example, found that increased opportunity or exposure time to cinema advertising is associated with an increased level of advertising recall. This also applies to OOH advertising, since the opportunity for exposure and to pay attention is increased with repetition or multiple exposures (Bhargava & Donthu, 1999; Wilson & Till, 2008). Veloutsou and O'Donnell (2005) estimated the exposure to transit advertising media from the perspective of the passer-by. They found that perceived contact with transit advertising was strongly related to the attention paid to the messages carried on the taxis. Therefore, the hypothesis is stated as follows:

H1: A statistically significant relationship exists between commuters' exposure to minibus taxi advertising and their attention paid to minibus taxi advertising. Attitudes and attention

According to the Fishbein theory, a consumer's attitude is a function of his or her own beliefs about an object and the evaluative aspects of these beliefs (Kaplan & Fishbein, 1969). The attitude towards advertising should be assessed, since it plays a major role in predicting advertising effectiveness in terms of consumers' exposure and reactions to advertising through a range of cognitive, affective and behavioural processes (Mehta, 2000). Consumers' attitudes tend to be more positive when offering entertainment or informativeness (Tsang, Ho & Liang, 2004; Sabuncuoğlu-İnanç, Gökaliler & Gülay, 2020).

A consumer's susceptibility to respond consistently towards advertising in general, either favourably or unfavourably, could mediate the effectiveness of any given advertisement (Mehta, 2000). This also applies to OOH advertising. Osborne and Coleman (2008) and Donthu, Cherian, and Bhargava (1993) found that consumers with a more positive attitude to advertising in general were more likely to remember advertising on outdoor billboards. Similarly, Prendergast and Hang (1999) observed that the noting of exterior bus advertising was higher when consumers had positive attitudes towards advertising. Veloutsou and O'Donnell (2005) report that commuters who appreciated the value of advertising in general were more likely to pay attention to taxi advertising. The second hypothesis for this project is thus suggested:

H2: A statistically significant relationship exists between commuters' attitudes towards advertising and their attention paid to minibus taxi advertising.

Attention and positive word of mouth

Positive word of mouth or discussion among consumers about advertising is often used as an indication of the success of unconventional advertising campaigns, rather than their ability to convince the audience to purchase the brands (Jurca & Madlberger, 2015). Taxi advertising, elevator advertising, aerial advertising and ambient advertising might also be regarded as part of unconventional advertising. The originality of unconventional advertising can positively affect attention to advertising and the memory of the advertised brand (Dahlén, Granlund & Grenros, 2009). Novelty and creativity applied to OOH advertising can also help to increase attention getting capacity (Baack, Wilson & Till, 2008; Wilson, Baack & Till, 2015). Unconventional advertising has proved to be effective by generating an additive effect of gaining and holding consumer attention, which is passed on to further downstream advertising effects, such as word-of-mouth and increased sales (Hutter & Hoffmann, 2014). Based on this explanation the third hypothesis for this paper is suggested:

H3: A statistically significant relationship exists between commuters' attention to minibus taxi advertising and positive word of mouth.

Attention and buying of advertised products

The behavioural responses such as trial, purchasing, and purchase intentions have been used in the past to examine the effectiveness of traditional OOH advertising (Bhargava & Donthu, 1999; Gombeski, Miller & Levine, 1999; Fortenberry & McGoldrick, 2019) as well as digital OOH advertising formats (Burke, 2009; Roggeveen, Nordfält & Grewal, 2016; Van de Sanden, Willem & Brengman, 2022; Willems, Brengman & Van de Sanden, 2017); and is thus also measured for minibus taxi advertising in this paper. Bhargava and Donthu (1999) used experimentation to investigate the sales in reaction to a large number of outdoor advertising boards in a specific area. They found that multi-media campaigns with more boards and promotional messages could help to increase the recall of the brands. This in turn contributed to the effectiveness of these campaigns. Gombeski, Miller and Levine (1999) explored the effectiveness of street-pole advertising. They found that it could increase awareness on a cognitive level, which in turn could also influence purchase intention and brand usage. Fortenberry and McGoldrick (2019) concur that outdoor advertising can be effective across the hierarchy of effects. They did, however, conclude that the buying of advertised products does indeed vary with the level of involvement in the purchase, relating to factors such as product role, price, life span, and purchase frequency.

Digital OOH advertising studies also shed light on the potential influence of the context in which customers are exposed to advertising messages, on their subsequent behaviour. Based on the analysis of

numerous academic and commercial experiments, Burke (2009) concluded that consumers are more likely to buy advertised products when the content features newsworthy information (seasonal offers, promotions) and relates to their task at hand and their current need state, rather than traditional brand messages. It was also confirmed that sales of advertised products depend on both the content of the message (appeal type and product category) and the context and quality of exposure (audience need state, traffic speed, and direction, message frequency and duration). Some more recent studies that examined location effects, found that customers exposed to advertising in proximity to where purchasing decisions are more, are more likely to notice the advertising and positively impact the effectiveness in terms of sales (Willems, Brengman & Van de Sanden, 2017; Sanden, Willem & Brengman, 2022). These findings suggest that higher attention paid could enhance consumers' behavioural or sales responses. The fourth hypothesis for this project is thus suggested:

H4: A statistically significant relationship exists between commuters' attention to minibus taxi advertising and their buying of advertised products.

METHODOLOGY

The target population for this study was regular minibus taxi commuters at the Mbombela taxi rank. The sample elements were minibus taxi commuters, while the sampling unit was the main taxi rank in Mbombela, Mpumalanga. More than 300 000 demographically diverse commuters pass through this rank daily (ComutaNet, 2015). The vast majority of them are economically active and fall within the middle-income bracket (ComutaNet, 2015). Non-probability quota sampling was applied to produce a sample of the population that is reasonably representative, as it mirrors the population (Saunders, Lewis & Thornhill, 2019). For this study, the ratio of the quota sampling was established before data collection in order to represent minibus taxi commuters and who were thus classified according to relevant characteristics (i.e. age and gender). The researcher then determined the envisaged quota (proportion) of sample elements with certain characteristics more or less the same as the elements in the population, as suggested by Wiid and Diggines (2015). Trained fieldworkers administrated the surveys over two weeks, including weekdays and weekends. Using fieldworkers to collect data at the rank over this period ensured that commuters with different travel patterns are included in the sample.

Various steps in the research process contributed towards the validity of the study. A thorough and critical review of the literature aimed to identify the various constructs relevant to the theories underlying the study was performed. These constructs provided a direct and indirect theoretical and conceptual link to explaining the phenomenon under investigation. Before finalising the questionnaire, it was pre-tested and a pilot study amongst a selection of potential target respondents furthermore contributed towards ensuring respondents understand all wording of individual questions in the same way. This contributed towards ensuring acceptable face validity of the question pool.

From a measurement perspective, the design of the questionnaire was subjected to a thorough review by Provantage Media Group (PMG), experts in transit advertising media, to maximize item appropriateness and to examine the extent to which proposed items cover all potential dimensions' (DeVellis, 2020). This contributed in particular to content and construct validity. Contribution towards the reliability of the data was addressed by ensuring that a significantly large sample was realised (n = 398). This contributed towards the general stability of the data with any further addition to the sample from the same target population not significantly changing the general response distribution.

The data was collected via an interview-administrated survey. Respondents who passed the data collection point at or close to the selected taxi ranks were screened to ensure they were regular minibus taxi commuters (i.e. at least once a week) and invited to participate in the study. A structured

EXPLORING MINI-BUS TAXI ADVERTISING EFFECTS

questionnaire with demographic questions and sections measuring exposure to minibus taxi advertising, attention paid to minibus taxi advertising, attitudes towards advertising, positive word of mouth, and buying of advertised products served as a measuring instrument. Scales for these sections were adopted from previous studies on the effectiveness of other types of transit advertising mediums (Veloutsou & O'Donnell, 2005; Roux, 2016) and then 5-point Likert scales ranging from "strongly agree" to "strongly disagree" were applied. The cognitive responses scales consisted of 10 items, while the affective and conative responses scales consisted of 5 items each. Where relevant the internal consistency reliability was assessed for scales. Cronbach alpha coefficient was calculated and considered acceptable since it ranged between $0.7 \le \alpha < 0.8$ for the relevant constructs (Pallant, 2020). The reliability of the construct, therefore, lies within the theoretical understanding of what is being measured.

The data were analysed using the Statistical Package for the Social Sciences (SPSS) 26. The data were subjected to descriptive statistics as well as hypotheses testing via Spearman's rank order correlation. Since the data were non-parametric, the Spearman rank correlation that does not carry any assumptions about the distribution of the data, and is the appropriate correlation analysis when the variables are measured on a scale that is at least ordinal, was used (Pallant, 2020). The main findings are presented below.

RESULTS

Sample profile and usage patterns

The sample consisted of 398 regular taxi commuters. This was in line with the quota sample planned, with an equal portion of males (49.5%) and females (50.55%) and most of them being younger than 40 years. The quota was thus aligned with the gender ratio and the relatively young population of minibus taxi commuters in South Africa as well as in Mpumalanga (StatsSA, 2022). The commuters surveyed, usually wait up to 30 minutes for taxis in the mornings (85.7%) and the afternoons (72.1%). They typically (50.3%) spend 30-60 minutes travelling inside a taxi per day. These long and recurring periods in the environment allow extended exposure to advertising and confirm that the sample obtained indeed represented regular commuters. Regular minibus taxi commuters' potential exposure to advertising on minibus taxis and other OOH advertising (advertisements at taxi ranks and billboards next to the road) is likely to be high since the minibus taxi is a major mode of transport for the majority of commuters who spend up to 3 hours per day commuting (StatsSa, 2022).

Hypotheses testing

Exposure and attention paid to minibus taxi advertising

The Spearman's rank order correlation revealed that there is a strong positive correlation between commuters' exposure to minibus taxi advertising and their attention to minibus taxi advertising (rs = 0.119, p = 0.018). Thus, the alternative hypothesis stating a statistically significant relationship between commuters' exposure to minibus taxi advertising and their attention to minibus taxi advertising is supported.

Table 1. Spearman's rank order correlations for hypothesis 1: Exposure and attention paid to minibus taxi advertising

Spearman's rho			Exposure	Attention
	Exposure	Correlation Coefficient	1.000	0.119*

		Sig. (2-tailed)	-	0.018	
		Ν	398	398	
	Attention	Correlation Coefficient	0.119*	1.000	
		Sig. (2-tailed)	0.018	-	
		Ν	398	398	
* Correlation is significant at the 0.05 level (2-tailed)					

Attitudes toward advertising and attention paid to minibus taxi advertising

The Spearman's rank order correlation revealed a strong positive correlation between commuters' overall attitude towards advertising and their attention to minibus taxi advertisements (rs = 0.244, p < 0.001). Thus the alternative hypothesis stating a statistically significant relationship between commuters' exposure to minibus taxi advertising and their attention to minibus taxi advertising is supported.

Table 2. Spearman's rank order correlations for hypothesis 2: Attitudes towards advertising and attention paid to minibus taxi advertising

Spearman's rho			Attention	Attitude	
Overall		Correlation Coefficient	0.244**	1.000	
	attitude				
		Sig. (2-tailed)	0.000	-	
		Ν	398	398	
	Attention	Correlation Coefficient	1.000	0.244**	
		Sig. (2-tailed)	-	0.000	
		N	398	398	
** Correlation is significant at the 0.01 level (2-tailed)					

Attention paid to minibus taxi advertising and positive word of mouth

The Spearman's rank order correlation showed a strong positive correlation between commuters' attention to minibus taxi advertising and their positive word of mouth (rs = 0.114, p = 0.023). Thus the alternative hypothesis stating a statistically significant relationship between attention paid to minibus taxi advertising and positive word of mouth is supported.

Table 3.	Spearman's rank orde	r correlations for	or hypothesis	3: Attention	paid to	minibus ta	xi advertising
	and positive word of m	outh					

4114 0001		0 4 4 1 1		
Spearman's rho			Attention	Positive word of mouth
	Attention	Correlation Coefficient	1.000	.0114*
		Sig. (2-tailed)	-	0.023
		Ν	398	398
	Positive word of	Correlation Coefficient	0.114*	1.000
	mouth			
		Sig. (2-tailed)	0.023	-
		Ν	398	398
* Correlation is sign	nificant at the 0.0	05 level (2-tailed)		

Attention paid to minibus taxi advertising and buying of advertised products

The Spearman's rank order correlation showed there is not a strong positive correlation between commuters' attention to minibus taxi advertising and the buying of advertised products (rs = 0.092, p = 0.066). Thus the null hypothesis is supported.

Table 4. Spearman's rank order correlations for hypothesis 4: Attention paid to minibus taxi advertising and buying of advertised products

Spearman's rho			Attention	Buying of advertised products
	Attention	Correlation Coefficient	1.000	0.092
		Sig. (2-tailed)	-	0.066
		Ν	398	398
	Buying of products being advertised	Correlation Coefficient	0.092	1.000
		Sig. (2-tailed)	0.066	-
		Ν	398	398

DISCUSSION

The hypotheses indicated a statistically significant relationship between exposure and attention paid to minibus taxi advertising is supported. This is in line with past studies that identified a significant positive relation between exposure and cognitive responses to advertising on billboards (Bhargava & Donthu, 1999), airport terminals, and preshow cinema advertising (Wilson & Till, 2008).

Furthermore, the hypothesis stating a statistically significant relationship between attitudes toward advertising and attention paid to minibus taxi advertising is supported. This finding supports studies such as that of Donthu, Cherian and Bhargava (19930); Osborne and Coleman (2008); Prendergast and Hang (2008) and Veloutsou and O'Donnell (2005), where it was reported that consumers who are positive towards advertising, in general, were more likely to pay attention to the advertising.

There was a significant relationship between commuters' attention paid to minibus taxi advertising and positive word of mouth. This finding is aligned with past studies on novel and creative OOH advertising (Baack, Wilson & Till, 2008; Wilson, Baack & Till, 2015). This implies that minibus taxi advertising messages are regarded as sufficiently innovative and original to activate word of mouth just as the unconventional advertising studied by Hutter and Hoffmann (2014).

However, no significant relationship between attention paid to minibus taxi advertising and reported buying of advertised products was found. This diverges from the past study by Bhargava and Donthu (1999) reporting that multiple exposures to promotional messages on outdoor advertising boards increased sales in a specific area. It is also not in line with the findings of Gombeski, Miller and Levine (1999) that street-pole advertising could increase awareness on a cognitive level, which in turn increases brand usage. Street-pole advertising messages are often repetitive since they are repeated over three sequential boards, to constantly re-enforcing the message. These divergent findings might be due to brands advertised on minibus taxi advertising not being in close enough proximity to actual point of sale or stores where buying decisions are being made or not offering sufficient exposure time or repetition. Another potential reason could also be due to the complex context in which commuters are being exposed to minibus taxi advertising amidst competing stimuli and high human density. This might also be due to advertising being more traditional brand messages rather than informational or promotional content that
help to address commuters' daily tasks or needs. It could also even be due to the socio-economic South African context where some of the products being advertised are not being bought because they simply cannot be afforded by some of the commuters.

MANAGERIAL IMPLICATIONS

Regarding minibus taxi advertising effects based on the hierarchy-of-effects theory, it can be concluded that there are significant relationships between key commuters' responses on cognitive and affective levels. Businesses using minibus taxi advertising are advised to design advertising with impactful physical features such as wrapping the whole vehicle, colour, and creative message. They should also consider how to attract attention amidst competing stimuli in the busy taxi rank environment. They must, therefore, design advertising and content to entertain the captive commuters and offer help during their daily trips. Commuters will become despondent if content is irrelevant, boring, or misleading.

A consumer's susceptibility to respond consistently towards advertising in general, either favourably or unfavourably, could mediate the effectiveness of any given advertisement. Advertisers should, therefore, capitalise on these positive opinions towards advertising by providing the target market with the information they value on any new products developed and which could guide their purchase decisions. They must create informative, entertaining, and truthful minibus taxi advertising campaigns to create positive attitudes towards the advertising and in turn are then more likely to remember the advertised brand.

To drive downstream advertising effects, such as word-of-mouth and increased sales marketers should design campaigns that integrate point-of-sale advertising media and use brand activations close to or inside stores where buying decisions are being made. This can be done by providing easily visible information required to facilitate sales (e.g. closest store location, telephone number, and store hours) and employing persuasive promotional advertising messages such as incentives to buy or combining it with below-the-line sales promotion activities at specific taxis ranks close to stores where it is sold.

To ensure sufficient exposure and repetition in a targeted area, taxi rank branding can be combined with minibus taxi advertising on the outside as well as inside the vehicle. To keep commuters interested, innovative transit marketing opportunities such as large digital advertising screens at taxi ranks; live events, or brand activations at targeted taxi ranks should be considered. This type of novel media in the transit environment can offer minibus taxi commuters with prolonged, meaningful interactions with brands to build brand affinity. Finally, if the aim is to increase sales, they should use promotional messages and content that help to address commuters' daily tasks or needs rather than generic messages aimed at just maintaining brand awareness. To increase the buying of advertised products promotional trial demonstrations and free sampling can be activated amidst the hustle and bustle of the taxi rank environment.

LIMITATIONS, DIRECTIONS FOR FUTURE RESEARCH CONCLUSION

Surveying commuters only at one major taxi rank imply that the findings could be regarded as explorative and prohibit the generalisation of findings. Forthcoming research should broaden the scope to advertising placed at more taxi ranks and transport hubs or even other media platforms used to target commuters, which remains the largest economically active middle-income group in South Africa (StatsSA, 20220). This research used the hierarchy-of-effects model as a theoretical framework; other theoretical views such as the information processing model of advertising effects or the heuristic-systematic model of information processing may provide additional insights. The conflicting results in terms of behavioural responses of the current study and the limited past OOH advertising studies

examining behavioral outcomes (Wilson 2020), direct the need for more research on this response level. In this sense, additional research should consider using experimental designs to examine the impact of message content, context, and quality of exposure on actual sales rather than reported behaviour.

OOH advertising media, including transit advertising, has not received the attention it deserves in the literature. The study aims to overcome this gap by exploring minibus taxi advertising effects based on the hierarchy-of-effects theory.

REFERENCES

- Alamanos, E., Brakus, J.J. & Dennis, C. (2015). How Digital Signage Affects Shoppers' In-Store Behavior: The Role of the Evoked Experience. Kubacki. K. *Ideas in Marketing: Finding the New* and Polishing the Old, Springer, Cham: 748 - 751.
- Ali, P. &, Safwan, A. (2019). Appealing Factors of Transit Advertisement as Outdoor Media: Analysis of Public Perception in Southern-Punjab. *Global Media Journal: Pakistan Edition*, 12 (2): 1-25.
- Baack, D.W, Wilson, R.T., & Till, B.D. (2008). Creativity and memory effects. Recall, Recognition, and an Exploration of Non-traditional Media. *Journal of Advertising*, 37(4): 85-94.
- Barry, T.E. & Howard, D.J. (1990). A Review and Critique of the Hierarchy of Effects in advertising. *International Journal of Advertising*, 9 (2): 121-135.
- Barry, T.E. (1987). The Development of the Hierarchy of Effects- An historical perspective. *Current Issues and Research in Advertising*, 10 (1-2): 251-295.
- Belch, G.E. & Belch, M.A. (2020). Advertising and Promotion: An Integrated Marketing Communications Perspective. Boston: McGraw Hill Higher Education. 4t edition.
- Bhargava, M. & Donthu, N. (1999). Sales Response to Outdoor Advertising. Journal of Advertising Research, 39 (4): 7-7.
- Bhargava, M., Donthu, N., & Caron, R. (1994). Improving the Effectiveness of Outdoor Advertising: Lessons from a Study of 282 Campaigns. *Journal of Advertising Research*, 34 (2): 46–55.
- Burke, R.R. (2009). Behavioral effects of digital signage. *Journal of Advertising Research*, 49 (2): 180-185.
- Buthelezi, L. (2020, May 13). Lockdown | Taxi industry will likely be one of few beneficiaries. *Fin24*. Retrieved June 29, 2022, from https://www.news24.com/fin24/Economy/South-Africa/lockdown-taxi-industry-will-likely-be-one-of-few-beneficiaries-20200513 2
- Chan, K. & Fung, M. (2013). Effectiveness of Subway Advertising in Hong Kong. *Journalism and Mass Communication*, 3 (12): 757-767.
- Comutanet. (2015). Commuters and their media. Retrieved June 29, 2022, from http://www.themarketingsite.com/knowledge/16657/commuters-their-media- consumption
- Cornelius, B., Natter, M., & Faure, C. (2010). How Storefront Displays Influence Retail Store Image. *Journal of Retailing and Consumer Services*, 17 (2): 143-151.
- Dahlén, M., Granlund, A., & Grenros, M. (2009). The Consumer-perceived Value of Non-traditional Media: Effects of Brand Reputation, Appropriateness and Expense. *Journal of Consumer Marketing*, 26 (3):155-163.
- Department of Transport. (2019). Fikile Mbalula on his plans as minister of transport. Retrieved June 29, 2022, from https://www.youtube.com/watch?v=VF0o008G-TQ
- DeVellis, R.F. & Thorpe, C.T. (2021). Scale Development: Theory and Applications. London: Sage Publications.
- Donthu, N., Cherian, J., & Bhargava, M. (1993). Factors Influencing Recall of Outdoor Advertising. Journal of Advertising Research, 33 (3): 64-72.
- Fobosi SC. (2022). South Africas mini-bus taxi industry has been marginalized for too long this must change. Retrieved June 29, 2022, from https://theconversation.com/south-africas-minibus-taxi-industry-has-been-marginalised-for-too-long-this-must-change-142060

- Gombeski Jr, W.R., Miller, P.L., & Levine, M.J. (1999). Measuring the Effects of Street Pole Banners on Consumer Awareness and Preference. *Journal of Hospital Marketing*, 13 (1): 1-12.
- Hutter, K. & Hoffmann, S. (2014). Surprise, Surprise. Ambient Media as Promotion Tool for Retailers. *Journal of Retailing*, 90 (1): 93-110.
- Hutter, K. (2015). Unusual Location and Unexpected Execution in Advertising: A Content Analysis and Test of Effectiveness in Ambient Advertisements. *Journal of Marketing Communications*, 21 (1): 33-47.
- Jurca, M.A. & Madlberger, M. (2015). Ambient Advertising Characteristics and Schema Incongruity as Drivers of Advertising Effectiveness. *Journal of Marketing Communications*, 21 (1): 48-64.
- Kaplan, K.J. & Fishbein, M (1969). The Source of Beliefs, Their Saliency, and Prediction of Attitude. *The Journal of Social Psychology*, 78 (1): 63-74.
- Kazmi, S.H.H. & Batra, S.K. (2009). Advertising and Sales Promotion. New Delhi: Excel Books.
- Khang, H., Sangpil, H., Sumin, S., A-Reum, J., & M-Jeong, K. (2016). A Retrospective on the State of International Advertising Research in Advertising, Communication, and Marketing Journals: 1963-2014. *International Journal of Advertising*, 35 (3): 540–68.
- Lehmann, D. & Shemwell, D.J. (2011). A Field Test of the Effectiveness of Different Print Layouts: A Mixed Model Field Experiment in Alternative Advertising. *Journal of Promotion Management*, 17 (1): 61-75.
- Letang, V. & Stillman, L. (2020). Global advertising forecast (winter update). MAGNA. Retrieved June 29, 2022, from https:// www-wp-stage.magnaglobal.com/magna-advertising-fore- casts-december-2020/
- MAGNA global. (2022). Global advertising market reaches new heights, and exceeds pre-covid levels. Retrieved June 29, 2022, from https://magnaglobal.com/global-advertising-market-reaches-new-heights-and-exceeds-pre-covid-levels/
- Mehta, A. (2000). Advertising Attitudes and Advertising Effectiveness. Journal of Advertising Research, 40 (3): 67-72.
- Molobela T.T. (2021). The role of the mini-bus taxi industry in promoting the development of small businesses in South Africa: a case of mankweng taxi association, Limpopo province. Dissertation. Retrieved June 29, 2022, from http://ulspace.ul.ac.za/bitstream/handle/10386/3771/molobela_tt_2021.pdf?sequence=3&isAllowed =y
- Myburgh, V. & Stuart, C. (2019). Insights from the entertainment & media outlook: 2019 2023: an African perspective. Pricewaterhouse Coopers, October 01. Retrieved June 29, 2022, from https://www.pwc.co.za/en/assets/pdf/entertainment-and-media-outlook-2019-2023.pdf
- Ngan, H.F.B. & Yang, F.X. (2019), Transit Advertising in Corporate Branding: A Multilevel Study. International Journal of Contemporary Hospitality Management, 31 (3):1452-1468.
- Osborne, A.C. & Coleman, R. (2008). Outdoor Advertising Recall: A Comparison of Newer Technology and Traditional Billboards. *Journal of Current Issues & Research in Advertising*, 30 (1): 13-30.
- Pallant, J. (2020). SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS. New York: Routledge. 7th Ed.
- Prendergast, G. & Hang, C.C. (1999). The Effectiveness of Exterior Bus Advertising in Hong Kong. Journal of International Consumer Marketing, 11 (3): 33-50.
- Primedia Outdoor. (2022). Rank advertising. Primedia Outdoor, January 18. Retrieved June 29, 2022, from https://primediaoutdoor.co.za/rank/
- Provantage. (2020). South Africa's leading out of home media specialist. Retrieved June 29, 2022, from https://provantage.co.za/business-unit/transit-ads/
- Roggeveen, A.L., Nordfält, J., & Grewal, D. (2016). Do Digital Displays Enhance Sales? Role of Retail Format and Message Content. *Journal of Retailing*, 92: 122–131.
- Roux, A.T. (2016). Practitioners' View of the Role of OOH Advertising Media in IMC Campaigns. Management: Journal of Contemporary Management Issues, 21 (2):181–205.

- Roux, A.T. & D.L.R. van der Waldt. (2014). Out-of- Home Advertising Media: Theoretical and Industry Perspectives. *Communitas*, 19: 95–115.
- Roux, A.T. (2018). The Effectiveness of Branded Motor Vehicles as an Advertising Medium to Target Young Adult Consumers in South Africa. Paper presented at The 2018 Annual Conference of the Emerging Markets Conference Board, University of the Witwatersrand, Wits Business School, Johannesburg, South Africa. 4-7 April 2018.
- Roux, A.T. & Maree, T. (2021). Joy to The (Shopper) World: An SOR View of Digital Place-based Media in Upmarket Shopping Malls. *Journal of Promotion Management*, 27 (7): 1031-1060.
- Roux, T., Van Der Waldt, D.L.R., & Ehlers, L. (2013). A Classification Framework for Out-of-home Advertising Media in South Africa. *Communicatio: South African Journal for Communication Theory and Research*, 39 (3): 383-401.
- Sabuncuoğlu-İnanç, A., Gökaliler, E., & Gülay, G. (2020). Do bumper ads bump consumers?: An empirical research on YouTube video viewers. El profesional de la información (EPI), 29(1). Retrieved June 29, 2002, from http://profesionaldelainformacion.com/contenidos/2020/ene/sabuncuoglu-gokaliler-gulay.pdf
- Saunders, M., Lewis P., & Thornhill, A. (2019). *Research Methods for Business Students*. London: Pearson Education Limited.
- StatsSa. (2022). National household travel survey. Retrieved July 30, 2022, from https://www.statssa.gov.za/?p=14063
- Suh, T., Wilson, R. T., & On, S. (2021). Gender Difference in Visual Attention to Digital Content of Place-based Advertising: A Data-driven Scientific Approach. *Electronic Commerce Research*, Volume (issue): 1-21.
- Taylor, C.R., Franke, G.R., & Bang, H.K. (2006). Use and Effectiveness of Billboards: Perspectives From Selective-Perception Theory and Retail-Gravity Models. *Journal of advertising*, 35 (4): 21-34.
- Tsang, M.M., Ho, S.C., & Liang, T.P. (2004). Consumer Attitudes Toward Mobile Advertising: An Empirical Study. *International Journal of Electronic Commerce*, 8 (3): 65-78.
- Van de Sanden, S., Willems, K., & Brengman, M. (2022). How Customers Motive Attributions Impact Intentions to Use an Interactive Kiosk In-store. *Journal of Retailing and Consumer Services*, 66: 102918.
- Van Meurs, L. & Aristoff, M. (2009). Split-second Recognition: What Makes Outdoor Advertising Work?. *Journal of Advertising Research*, 49 (1): 82-92.
- Veloutsou, C. & O'Donnell, C. (2005). Exploring the Effectiveness of Taxis as an Advertising Medium. International Journal of Advertising, 24 (2): 217-239.
- Wiid, J. & Diggines, C. (2015). Marketing Research. Cape Town, SA: Juta & Company Ltd.
- Wijaya, B.S. (2015). The Development of Hierarchy of Effects model in Advertising. *International Research Journal of Business Studies*, 5(1).
- Willems, K., Brengman, M., & Van de Sanden, S. (2017). In-store Proximity Marketing: Experimenting With Digital Point-of-sales Communication. *International Journal of Retail & Distribution Management*, 45 (7/8): 910-927.
- Wilson, R.T. & Casper, J. (2016). The Role of Location and Visual Saliency in Capturing Attention to Outdoor Advertising: How Location Attributes Increase the Likelihood for a Driver to Notice a Billboard Ad. *Journal of Advertising Research*, 56 (3): 259-273.
- Wilson, R.T. & Suh, T. (2018). Advertising to the Masses: The Effects of Crowding on the Attention to Place-based Advertising. *International Journal of Advertising*, 37 (3): 402-420.
- Wilson, R.T. & Till, B.D. (2008). Airport Advertising Effectiveness: An Exploratory Field Study. *Journal* of Advertising, 37 (1): 59-72.
- Wilson, R.T. & Till, B.D. (2011). Effects of Outdoor Advertising: Does Location Matter? Psychology & Marketing, 28 (9): 909-933.
- Wilson, R.T. & Till, B.D. (2013). Recall of Preshow Cinema Advertising: A Message Processing Perspective. *Journal of Marketing Communications*, 19 (1): 1-21.

- Wilson, R.T. (2022). Out-of-Home Advertising: A Systematic Review and Research Agenda. *Journal of Advertising*, Vol (issue): 1-21.
- Wilson, R.T., Lohmeier, J.H., Lustick, D.S., & Chen, R.F. (2021). Using Transit Advertising to Improve Public Engagement With Social Issues. *International Journal of Advertising*, 40 (5): 783-809.
- Wilson, R.T., Baack, D.W., & Till, B.D. (2015). Creativity, Attention, and the Memory for Brands: An Outdoor Advertising Field Study. *International Journal of Advertising*, 34 (2):232–61.
- Woodside, A.G. (1990). Outdoor advertising as experiments. Journal of the Academy of Marketing Science, 18 (3): 229-237.

DIGITAL FINANCIAL INCLUSION: A SYSTEMATIC LITERATURE REVIEW

Subiakto Soekarno and Marla Setiawati

Received May 31st, 2022; First Revision August 3rd, 2022; Second Revision August 29th, 2022; Accepted October 17th, 2022

ABSTRACT

This study aims to identify gaps in digital financial inclusion (DFI). By examining the deficiencies in previous research methods, inequality variables, and variables related to DFI, it offers an important direction for further research. Inequality variables include gender, age, and disability. Variables related to DFI consist of education, security or safety, technology, and economy related to cost and income. Research gaps are identified using a systematic literature review and categories from three main aspects. Focusing on developing countries from literature data shows that the gap in the previous method lies in simulation and action research, and the gap in inequality variables involves age and disability. The gap in variables related to digital financial inclusion involves education, safety, and the economy. Overall, results of this study suggest that more research is required in the field of financial inclusion.

Keywords: digital financial inclusion, inequality, systematic literature review, digital financial services, financial inclusion

INTRODUCTION

In recent years, rapid technological advancements have continued to impact the broader economy, especially the financial sector. Within this domain, digital financial inclusion (DFI) has gained increased momentum because of its ability to grant a wider digital access to the use of formal financial services (Soekarno & Setiawati, 2020). Financial literacy is the awareness, knowledge, skill, attitude, and behavior required to make sound financial decisions and achieve individual financial well-being (Kempson, 2009). According to the World Bank, financial inclusion is defined as individuals and businesses having access to useful and affordable financial products and services that meet their need transactions, payments, savings, credit, and insurance—delivered responsibly and sustainably. Access to a transaction account is the first step toward greater financial inclusion because it allows people to store money and send and receive payments. Financial literacy directly impacts financial inclusion; educated people understand the

Subiakto Soekarno is a faculty member at the ITB School of Business and Management. He earned an undergraduate degree (Majoring in Mechanical Engineering) from Institute Technology Bandung in 1983. Funded by General Electric Scholarship, he continued his study at the Oklahoma State University – USA in 1992, where he earned an MBA degree. He has over 25 years of professional experience in various companies especially in the strategic industry/state owned and multinational company. His research interests include but are not limited to: Corporate Finance, Established Company and Start Up Company Valuation, Mergers & Acquisition, Entrepreuneurship, Capital Market and Portfolio Management.

Marla Setiawati (corresponding author), student of Doctoral of Science in Management, School of Business and Management, Institut Teknologi Bandung. She earned her master's degree in finance in Institut Teknologi Bandung. Her research interest in innovation, supply chain management, finance. She joined the Operation and Performance Management Group in School of Business and Management, Institut Teknologi Bandung.

benefits of financial services better and feel confident in approaching financial providers. The high level of financial literacy in the community and digital and financial technology literacy behaviors and attitudes make it easier to promote the use of digital financial innovation products to increase financial inclusion.

Information about digital financial innovation does not directly mediate the relationship between financial literacy and financial inclusion (Widyaningsih et al., 2021). In contrast, digitalization is related to technological developments that help improve DFI either in developed countries or developing countries. Digital financial services offer a variety of advantages, including easy access, flexibility, and real-time services. Based on these benefits, digital financial services are expected to be more widely adopted to increase financial inclusion. Mobile financial services can also be more convenient and affordable than traditional banking, allowing users to manage their money daily. They act as financial controllers in their families, planning for the future, comparing financial products, and keeping them informed.

Financial inclusion ensures that all segments of society, including those with the lowest incomes, have equal access to regulated financial products and services. Digital technology has already emerged as a game-changing enabler in many industries, and it is now beginning to significantly impact financial services. Financial inclusion has the potential to be significantly impacted by digital financial services. Ozili (2018) concluded the advantages and disadvantages of DFI. Examples of advantages are expansion of financial services to non-financial sectors, convenient and secure banking services for the poor, increase in aggregate expenditure in digitalized economies, boosted GDP of digitalized economies, reduced circulation of bad/fake money, and giving customers more control over their finances, allowing quick financial decisions and enabling them to make and receive payments in seconds, thus generating revenue for digital finance providers. In recent decades, the implementation of digital financial inclusion has evolved as a discipline, resulting in many methods, inequality factors, and variables related to digital financial inclusion. Digital financial services provide numerous benefits, including easy access, flexibility, and real-time services. Based on these benefits, digital financial services are expected to be more widely adopted to increase financial inclusion. Mobile financial services can also be more convenient and less expensive than traditional banking, allowing users to manage their money daily, act as financial controllers in their families, plan for the future, compare financial products, and keep themselves informed.

However, digital finance does not serve people who do not have mobile phones or digital devices; it is overly reliant on internet connectivity, which excludes people who do not have internet connectivity; and how digital finance is introduced in a country (voluntarily or forced) can lead to voluntary financial exclusion if the population is not ready for it. Fee-based digital finance platforms will benefit high- and middle-income individuals at the expense of poor and low-income individuals who cannot afford the associated transaction costs. In addition, many policy and regulatory environments do not support full-scale digital finance. Papers that are disseminated as a literature review focus on those advantages and disadvantages; however, no research has elaborated on the categories of DFI. The current research does not ignore the weaknesses of DFI and does not highlight the advantages of DFI. It focuses on the synthesis of selected categories in selected papers.

DFI uses formal financial services via the internet. Thus, this study aims to synthesize research in DFI so that gaps can be identified as directions for further research. The categories used in synthesizing previous research are, first, methods in previous studies. Second, aspects of inequality that occur in DFI consist of gender, age, and disability. Third, variables related to DFI include education, security or safety, technology, and cost or income (economy factor).

Because nearly half of the people in the developing world already own a mobile phone, digital finance has the potential to increase financial inclusion, expand financial services to non-financial sectors,

DIGITAL FINANCIAL INCLUSION: REVIEW

and develop essential services for individuals (Ozili, 2018). The importance of discussing inequality from gender, age, and disability is that many people lack access to these technologies, primarily affecting marginalized communities, particularly women and people with disabilities (Aranda-Jan et al., 2019). Women, elderly people, and people with disabilities have unequal opportunities regarding the use of DFI.

Inequality has become the most critical category in this research because DFI is hampered by gender, age, and disability inequalities. Financial inclusion is important to enhance economic growth and mitigate poverty, specifically in unreachable areas. The advantages of DFI include the expansion of financial services to non-financial sectors, access to convenient and secure banking services for the poor, increased aggregate expenditure to boost the GDP of digitalized economies, reduction of the circulation of bad/fake money, increased customer control over their finances, ability to make and receive payments in seconds, ability to make and receive payments in seconds, and ability to earn cash for digital finance providers (Ozili, 2018).

The novelty of this research is related to the importance of the research category in method, variables inequality, and variables related to DFI. We sorted papers according to the highest citation criteria. The results should contribute to the academic or practical view, especially in developing countries. This study shows that the application of DFI has not been widely studied empirically.

The strengths and originality of this research are that it uses current updated selected papers and identified gaps through three categories. Thus, from the academic and practical perspective, the potential of this study hints at high novelty and originality, and the studies related to DFI in three categories have been very limited to non-existent. This paper focuses on the categories of methods from previous research, inequality variables, and variables involved in DFI. The classes related to those mentioned above have received very little attention in literature. Insights from this paper can improve our understanding of DFI area research and help researchers do the following by filling the gap of the newest area in the categories. The remainder of the paper is structured as follows. Section 2 discusses the methodology. Section 4 provides the discussion and analyzes the gaps. Section 5 concludes.

METHOD OF ANALYSIS

A systematic literature review was performed to examine the empirical evidence of DFI in developed and developing countries. Systematic reviews have some advantages. For example, they provide a clear and comprehensive overview of the available evidence on a specific topic. Furthermore, systematic reviews aid in the identification of research gaps in our current understanding of the field. They can draw attention to methodological issues in research studies that can be used to improve future work in the field. Finally, they can be used to identify questions for which the available evidence provides clear answers, implying that additional research is unnecessary. To be eligible, studies should use selected papers published in English from 2013 to 2021, including methods in previous research, aspects of inequality in DFI, and variable interest in DFI. The period is based on the most relevant database search results with related keywords and ends in 2021. The search strategy comprised the main electronic bibliographic database, namely, Scopus, a manual review of the reference lists of relevant articles, and a review of DFI. Iterative thematic analyses were used to synthesize the findings relating to the categories above.

Studies that met the following criteria were included: (i) the study evaluated DFI; (ii) the study was published in English between January 2013 and December 2021. Peer-reviewed and gray literature evaluations of all types, including qualitative, formative, or process evaluations, were eligible. The exclusion criteria included non-English language studies and studies conducted in developed countries because many people continue to lack access to these technologies, primarily affecting marginalized

communities, particularly women and people with disabilities, specifically in developing countries (Jan et al., 2019).

This research also excluded unpublished reports (such as dissertations or conference abstracts) and non-relevant keywords, such as nursery, blockchain, industry 4.0, and others.

A preliminary literature search was conducted to identify relevant search terms and to guide the development of study appraisal documents. The search strategy included electronic and manual searches. Electronic search was the primary means of identifying relevant studies and comprised the main electronic bibliographic databases of peer-reviewed literature: Scopus. These journals included: Development in Practice, International Journal of Applied Business and Economic Research, International Journal of Financial Studies, International Journal of Law in Context, International Journal for Equity in Health, Information Technology for Development, Ageing and Society, The World Bank Research Observer, International Journal of Scientific & Technology Research, New Political Economy, Borsa Istanbul Review, International Journal of Information Management, Information Systems Journal, International Journal of Consumer Studies, Technology in Society, Investment Management and Financial Innovations, Education and Training, World Development, Journal of Asia Business Studies, Information Technology & People, and Research in International Business and Finance.



Figure 1: Flowchart of the search and screening process

Figure 1 illustrates the search and screening process. Once the search terms were applied to the electronic databases, the initial selection of potentially relevant citations was based on screening the title

DIGITAL FINANCIAL INCLUSION: REVIEW

and abstract by the primary reviewer. Data were extracted and documented in a study appraisal form for the following items: article identification number, author, year of publication, search strategy source, publication journal (if applicable), country, study design, DFI description, study objective, sample/participants, data collection method, theoretical framework, primary outcome(s), gender relationsrelated indicator(s), and critical gender relations-related findings. All corresponding completed appraisal forms were compared. The findings and implications related to DFI were synthesized using the category approach. The category consists of methods from previous studies, inequality related to DFI, and variables related to DFI, such as education, security or safety, technology, and cost and/or income (economy factor).

Figure 2 shows the reviewed categories in this research. Three main categories were used. The first is the method. This paper synthesizes the method of each paper selected because the methodology clarifies the research inquiry and why it is necessary. It clarifies the research's beginning stage, its bearings, and the potential ramifications of the research when it is completed. When researchers know what methods have been used in previous studies, then the differences can be examined in research results from the advantages of each method. The second category is related to inequality. This paper identifies three points of inequality: gender, age, and disability. Improved and more effective financial inclusion will reduce gender inequality (Soekarno & Setiawati, 2020). The age difference, which stems from generational differences, complicates the absorption of different technological capabilities, particularly in daily transactions.

Furthermore, because of the societal stigma of not being able to adapt like normal people, disabilities are frequently underestimated. The third category is related to variables involved in DFI: education, safety or security, technology, and the economy. These criteria come from who the users of DFI are. Users have a certain economic level, the ability to adapt to technology, trust in the system's security, and a certain level of education.



Figure 2: Category of papers

RESULTS AND DISCUSSION

Based on the 30 selected papers, the research generally occurred in developing countries (i.e., 22 papers), and the rest were in developed countries. By using the three categories previously described, we found the following results from the analysis related to the differences, similarities, disadvantages, and advantages of papers per category:

Past studies on the method

This section explains the methods used in DFI research. This category follows that of Saunder et al. (2012) and the relevance of this research topic; five topics are in the highlighted: simulation, survey, case study, literature review, and action research. The simulation referred to in this section is a simulation using the software as an example of a system dynamic or agent-based modeling and other types of simulation. A literature review is a form of study that discusses previous research. Action research uses the main method of real action in the field where research data are collected. Of the papers analyzed for DFI research methods, 16 used surveys and interviews, 12 used a literature review, 8 used case studies, 1 used action research, and no paper used simulation and modeling. Based on surveys and interviews, Aranda-Jan et al. (2019) used 115 interviews conducted for two of the studies, 60 of which were with people with disabilities and 55 with key informants (26 in one study and 29 in another). The third study included 3,000 face-to-face surveys and 55 focus groups. Hasbi and Dubus (2020) used micro-level data from household surveys over five years (2013-2017). Based on the literature review, the collection includes four articles on financial inclusion that discuss a variety of interventions and experiences and the opportunities and challenges to meaningful financial inclusion for women and nonliterate and nonnumerate populations (Arnold & Gammage, 2019). To assess the impact of artificial intelligence (AI) on DFI, Mhlanga (2020) used conceptual and documentary analyses of peer-reviewed journals, reports, and other authoritative documents on AI and DFI.

Digitizing government-to-person payments can significantly reduce costs, increase efficiency and transparency, and assist recipients in becoming more comfortable with digital payments (Klapper & Singer, 2017). Based on the case study, Ibtasam et al. (2017) found triangulation in their case study (observation, survey, and interview). Based on action research, Tiwari et al. (2019) researched BOMA as a non-profit organization based in the United States and a Kenyan NGO with a transformative approach to poverty alleviation and resilience building. REAP (Rural Entrepreneur Access Project), BOMA's flagship program, began in 2008 and is a rolling two-year gender-focused poverty graduation program that seeks to transform the situation of vulnerable women by providing them with the tools, training, and resources needed to start and maintain small businesses, establish sustainable incomes, and move out of poverty. The barriers were found in the cases of Kenya. Hence, based on the findings of a synthesis of previous research that discusses existing methods, the simulation method, which has the advantage of avoiding wasting resources directly, is rarely used in DFI research. In addition to simulation, action research is unfamiliar because it has the flaw of going directly and changing the existing system in the research object's area of interest.

Past studies on inequality

The inequality in DFI consists of gender, age, and disability. Six papers discussed inequality in age, one on disability, and the rest related to gender inequality. Aranda-Jan et al. (2019) stated that persons with disabilities report barriers to inclusion in their socioeconomic contexts, such as stigma, a

DIGITAL FINANCIAL INCLUSION: REVIEW

lack of access to and awareness of appropriate assistive technologies, a lack of coordination of activities and initiatives by ecosystem stakeholders, and a lack of private sector engagement. Differences in mobile phone ownership between disabled and non-disabled refugees in humanitarian situations vary depending on the context. Arnold & Gammage (2019) stated that financial and DFI is not automatic; they necessitate a slew of parallel investments in women's literacy, numeracy, and intrahousehold bargaining and negotiation, allowing women to retain control over their earnings and savings. Digital inclusion is positively correlated with financial inclusion because mobile money users and bank account holders are more likely to use mobile broadband. The papers showed that the elderly, those with the lowest level of education, and women are the most likely to be excluded from mobile broadband use (Hasbi & Dubus, 2020). Natile (2019) researched M-Pesa (mobile money for Kenya) and found that although M-Pesa has increased the number of women who can access formal financial services, it has failed to contribute to challenging unequal gender relations at the lower end of income distribution, owing to a lack of corresponding redistributive measures addressing the gendered socioeconomic inequalities that have caused and reproduced financial exclusion. According to the current literature, mobile phone programs can have a meaningfully positive impact on gender relations by providing new modes for couple's health communication and cooperation and enabling greater male participation in health areas typically targeted toward women. Women's decision making, social status, and access to health resources were all improved due to MHealth initiatives. However, by design, programmatic experiences may unintentionally reinforce the digital divide and perpetuate existing gender-based power imbalances. Domestic strife and a lack of spousal approval also hamper women's participation (Jennings & Gagliardi, 2013). Mobile banking enables women to receive the total amount of grants from agents securely and conveniently.

In contrast, mobile banking has imposed human, socioeconomic, and technological constraints that have limited women's access to and use of financial services, thereby limiting financial inclusion. Women have been socially and politically empowered, and social inclusion has transformed (Kemal, 2019). Gender influences individuals' financial capability and decision making, technological access, and physical movement. As a result, women's ability to make decisions and take actions that lead to the adoption and use of digital financial services is harmed (Ibtasam et al., 2018). The traditional banking system and current digital financial service infrastructure do not meet the needs of low-income, illiterate women in patriarchal and religious societies such as Pakistan (Mustafa et al., 2019). The findings also highlight the importance of ensuring that older people can remain digitally included throughout their lives, including after the onset of poorer health, given that some of these people benefit the most from internet services (Matthews et al., 2019).

Most DFI research has discussed inequality in terms of gender, but issues related to age and disability have not been widely addressed. This is because gender is part of the sustainable development goals (SDGs) of the United Nations. Gender equality, according to the fifth SDG, means that women will play the same role as men now and in the future. In addition, limitations in conducting research across generations or objects of disability are other obstacles.

Past studies on variables involved in DFI

Based on the papers selected, four variables are involved in DFI based on the highest citation: education, security and safety, technology, and cost and/or income (economy factor). A total of 22 papers focused on technology, 4 were related to education, 4 involved cost and or income, and only 2 discussed security or safety in DFI. Tiwari et al. (2019) stated that participants could not fully utilize the digital product because of a lack of education, unfamiliarity with digital technology, and financial preference. A strong positive relationship has been found between age and mobile banking and between income and internet banking. Concerns about safety and security are the main reasons for occasionally using digital platforms. Furthermore, the lack of consistent income is the main reason for not using it (Meena et al., 2017). Ibtasam et al. (2017) concluded that audio assistance reduced the need for intermediate aid in

learning to use a mobile money app by low-literate users with limited smartphone exposure. Mhlanga (2020) stated that AI significantly impacts DFI in risk detection, measurement, and management, addressing information asymmetry, providing customer support and helpdesks via chatbots, and facilitating fraud detection and cybersecurity. Information, Communication, and Technology (ICT) diffusion has a positive relationship with financial inclusion and a negative association with poverty and inequality. The study's findings indicate that financial inclusion has a poverty-reducing effect, measured in either direction. Furthermore, when ICT dimensions are used for financial inclusion, they accelerate economic growth and reduce poverty and inequality (Mishra, 2019).

Based on the gap analysis for each of the above categories, Figure 3 shows that simulation/modeling and action research are rarely encountered. When viewed from the inequality category, research is rarely found to be related to disability. The categories related to variables in DFI are education, safety/safety, and associated costs and income (economy).



Figure 3: Reviewed Category and Research Gap

CONCLUSION

A total of 30 papers were selected based on keywords relevant to digital financial inclusion (DFI). This process was combined with an intensive literature review and was based on the division of categories consisting of the method, inequality in DFI, and variables involved in DFI. Several research gaps in each category can be an opportunity for future research. Most research has focused on gender inequality, but little research has discussed disability inequality. The methods in previous studies have gaps, such as in simulations and action research. First, action research has rarely been conducted because it poses a significant risk to the environment involved in DFI. The second gap is simulation, which has an advantage in DFI in that it allows the investigation of risks and policies, especially between actors, to minimize problems. From the variables involved in DFI, future research opportunities may involve education, safety or security, and cost and/or income (economy).

LIMITATIONS

Our research has the following limitations: Based on the literature review, we identified significant aspects through a holistic review of the literature on DFI. This study only paid attention to a systematic literature review with selected papers. In addition, this research focuses on data sources. The selected papers only used data from Scopus and ProQuest. The findings' generalizability may be limited to similar circumstances. Another limitation is that the research time ranged from 2013 to 2021.

Limitations also arise from the keywords used and the categories the authors chose to synthesize from previous research. These limitations allow research to be conducted beyond the scope of the gap presented in this study.

REFERENCES

- Aranda-Jan, C. B., Casswell, J., & Nique, M. (2019). Mobile technologies as assistive technologies in humanitarian and development contexts. 2019 IEEE Global Humanitarian Technology Conference, GHTC 2019. https://doi.org/10.1109/GHTC46095.2019.9033055
- Arnold, J., & Gammage, S. (2019). Gender and financial inclusion: The critical role for holistic programming. *Development in Practice*, 29(8), 965–973. https://doi.org/10.1080/09614524.2019.1651251
- Divya Meena, S., Sriram, M., & Sundaram, N. (2017). Digital financial inclusion is a need of the hour: An investigation amongst bank account holders in Vellore district of Tamil Nadu, India. *International Journal of Applied Business and Economic Research*, 15(21), 1–6.
- Hasbi, M., & Dubus, A. (2020). Determinants of mobile broadband use in developing economies: Evidence from Sub-Saharan Africa. *Telecommunications Policy*, 44(5), 101944. https://doi.org/10.1016/j.telpol.2020.101944
- Ibtasam, S., Mehmood, H., Razaq, L., Shah, K., Anwar, H. W., Webster, J., Kumar, N., & Anderson, R. (2018). Knowledge, access, and decision-making: Women's financial inclusion in Pakistan. Proceedings of the 1st ACM SIGCAS Conference on Computing and Sustainable Societies, COMPASS 2018, July. https://doi.org/10.1145/3209811.3209819
- Ibtasam, S., Mehmood, H., Razaq, L., Webster, J., Yu, S., & Anderson, R. (2017). An exploration of smartphone based mobile money applications in Pakistan. ACM International Conference Proceeding Series, Part F132087. https://doi.org/10.1145/3136560.3136571
- Jennings, L., & Gagliardi, L. (2013). Influence of mhealth interventions on gender relations in developing countries: A systematic literature review. *International Journal for Equity in Health*, 12(1), 1–10. https://doi.org/10.1186/1475-9276-12-85
- Kemal, A. A. (2019). Mobile banking in the government-to-person payment sector for financial inclusion in Pakistan*. *Information Technology for Development*, 25(3), 475–502. https://doi.org/10.1080/02681102.2017.1422105
- Kempson, E. (2009). Framework for the Development of Financial Literacy Baseline Surveys: A First International Comparative Analysis. OECD Working Papers on Finance, Insurance and Private Pensions, No. 1, OECD. Publishing.
- Klapper, L., & Singer, D. (2017). The opportunities and challenges of digitizing government-to- person payments. *World Bank Research Observer*, *32*(2), 211–226. https://doi.org/10.1093/wbro/lkx003
- Matthews, K., Nazroo, J., & Marshall, A. (2019). Digital inclusion in later life: Cohort changes in internet use over a ten-year period in England. *Ageing and Society*, 39(9), 1914–1932. https://doi.org/10.1017/S0144686X18000326
- Mhlanga, D. (2020). Industry 4.0 in finance: the impact of artificial intelligence (ai) on digital financial inclusion. *International Journal of Financial Studies*, 8(3), 1–14. https://doi.org/10.3390/ijfs8030045
- Mustafa, M., Mazhar, N., Asghar, A., Usmani, M. Z., Razaq, L., & Anderson, R. (2019). Digital Financial Needs of Micro-entrepreneur Women in Pakistan: Is mobile money the answer? Conference on Human Factors in Computing Systems - Proceedings, 1–12. https://doi.org/10.1145/3290605.3300490
- Natile, S. (2019). Regulating exclusions? Gender, development and the limits of inclusionary financial platforms. *International Journal of Law in Context*, 15(4), 461–478. https://doi.org/10.1017/S1744552319000417

- Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review*, 18(4), 329–340. https://doi.org/10.1016/j.bir.2017.12.003
- Soekarno, S., & Setiawati, M. (2020). Women and Digital Financial Inclusion in Indonesia As Emerging Market. International Review of Management and Marketing, 10(5), 46–49. https://doi.org/10.32479/irmm.10212
- Tiwari, J., Schaub, E., & Sultana, N. (2019). Barriers to "last mile" financial inclusion: cases from northern Kenya. *Development in Practice*, 29(8), 988–1000. https://doi.org/10.1080/09614524.2019.1654432.
- V Widyaningsih, D., Siswanto, E., & Zusrony, E. (2021). The role of financial literature through digital financial innovation on financial inclusion (case study of MSMES in Salatiga City). *International Journal of Economics, Business and Accounting Research*, *5*(4).

JGBAT MANUSCRIPT GUIDELINES

TOPICS

Finance

- Financial management
- Investment management

Management

- General and strategic management
- Entrepreneurship
- Intrapreneurship
- SMMEs and family businesses
- Human resource management
- Supply chain management and logistics
- Sustainability
- Tourism management

International Trade

• The knowledge economy and the wisdom era

Marketing

- Services marketing
- Relationship marketing
- Societal marketing
- Marketing communication management
- Consumer behavior

Information Technology

PURPOSE OF THE JOURNAL

Technology and Innovation Management

As an interdisciplinary refereed journal, the purpose of the Journal of Global Business and Technology (JGBAT) is to contribute to the advancement of knowledge related to the theory and practice of international business and technology management. Its primary goal is to present scholarly and managerially relevant articles on a wide variety of topics in international business and technology management to a broad audience in academia (educators, administrators, students), industry (business executives, consultants), as well as those involved in formulating and implementing public policy. The unique contribution of the journal is managerial policy and region-specific research. Articles should be timely and relevant. Authors are required to provide guidelines, techniques, and suggestions for problem solving in international business and technology management. Case studies relating to specific organizations, products/services, and industries are also welcome. It is a prime objective of JGBAT to bridge the gap between theory and practice. To this end, articles should offer strong managerial insights to help in the development of action-oriented business programs and strategies.

SUBMISSION GUIDELINES

1. Submissions must be made electronically to:

Dr. N. Delener Editor-in-Chief Email: info@gbata.org, delener@gbata.org

Submission of a manuscript implies that it contains original unpublished work and is not being submitted for publication elsewhere. Upon acceptance of a manuscript, authors will be asked to

transfer copyright of the manuscript to the publisher. This transfer will ensure the widest possible dissemination of information.

2. A cover letter must accompany each submission indicating the name, address, telephone number, fax number and e-mail of the corresponding author. The cover letter must indicate that the manuscript is not currently being considered at another publication.

STYLE GUIDELINES

- 1. Manuscripts must be double-spaced with normal margins (Top: 1 inch, Bottom 1 inch, Left: 1 inch, Right: 1 inch) and Letter size (8.5 inches x 11 inches). All pages should be numbered sequentially.
- 2. Manuscripts should have a cover page with the following information of each author: name, affiliation, and area of concentration (e.g., accounting, marketing, etc.). No other pages should contain information about the authors. The cover letter must indicate that the manuscript is not currently being considered at another publication.
- 3. An abstract of at least 200 words, including 5 key words, must appear on the 2nd page of the manuscript. The abstract must state an adequate summary of article's content (i.e., objective(s), rationale, methodological rigor, and major contributions & implications).
- 4. The paper itself should begin on the 3rd page. Manuscripts should not exceed 25 double-spaced pages including tables, figures, and references. Manuscripts that exceed these limits are routinely returned to the authors for shortening before consideration.
- 5. Tabular material and figure legends should be in box form and incorporated in the proper part of the text. They should also be contained in the Microsoft Word and cannot be hand drawn. Tables should be numbered in Arabic numbers (i.e., Table 1). Columns should be set using tab stops, not spaces, so they align. Figures are numbered similarly to tables (i.e., Figure 1).
- 6. References should be made by the in-text form of citation. The Reference List should include information for all sources cited in the manuscript. The author should make sure that there is a strict one-to-one correspondence between the references in the text and those on the list. It should be double spaced and listed in alphabetical order according to APA style by author's last name, but including first name initial, on a separate sheet at the end of the manuscript.

The following are examples of proper form:

Journal Article

Hurmelinna-Laukkanen, P., Ritala, P., & Sainio, L. (2013). Protection of Radical Innovations-Differences in Domestic and International Markets. *Journal of Global Business and Technology*, 9 (1): 1-16.

Authored Book

Delener, N. (1999). *Strategic Planning and Multinational Trading Blocs*. Connecticut, USA: Quorum Books.

Edited Book

Delener, N. (Ed.) (2012). Service Science Research, Strategy, and Innovation: Dynamic Knowledge Management Methods, U.S.A. IGI Global.

Chapters in Edited Book

Delener, N. & Lees, F. (2001). Global Planning of Business Activity. In Milner, M. & Lees, F. (Eds.), *Management of the Modern Company*, Moscow, Russia: 366 – 378.

Paper Presented at ...

Sturma, P. (2009). Global Challeneges and International Law. Paper presented at Global Business and Technology Association's Eleventh Annual Conference, Prague, Czech Republic, July.

Published Proceedings

Florinda, M., Rodrigues, S., Lopes, A., & Matos, N. (2011). Intellectual Capital Tool. In Delener, N., Fuxman, L., Lu, V. & Rivera-Solis, L.E. (Eds). Fulfilling the Worldwide Sustainability Challenge: Strategies, Innovaitons, and Perspectives for Forward Momentum in Turbulent Times (pp. 615-621). USA: GBATA Press.

Instance of Publication in press

Afriyie, K., Torres-Baumgarten, G. & Yucetepe, V. (in press). Internationalization and Value-Creation Perfromance of Latin American Multinationals: The Case of Outbound Foreign Direct Investment. *Journal of Global Business and Technology*.

Article in an Internet-Only Journal

- Fredrickson, B. L. (2000, March 7). Cultivating positive emotions to optimize health and well-being. *Prevention & Treatment, 3*, Article 0001a. Retrieved November 20, 2000, from http://journals.apa.org/prevention/volume3/pre0030001a.html
 - 7. Include and cite references from the previously published JGBAT issues if relevant.
 - 8. Strongly observe the language, grammar, and punctuation. All spelling, grammar, and punctuation are the responsibility of the author(s). No corrections will be made by the JGBAT Editors. **Therefore, all articles must be edited professionally prior to submission.**
 - 9. Acknowledge the anonymous reviewers. Acknowledgements and information on grants received must be stated before the References.
- 10. Sections of the paper such as the INTRODUCTION should be justified with one extra line space between section heading and text. Headings should be centered in all capital letters. Subheadings should be aligned left in upper and lower-case letters, with one extra line spacing above and no extra line spacing below the subheading. For subheadings below the first level subheading, indent one tab for next subheading.

- 11. The text should appeal to a wide audience by avoiding the use of methodological/technical jargon wherever possible. It may be more appropriate to include technical details in an appendix rather than in the body of the article.
- 12. Every effort should be made to avoid the use of specific national names of organizations and/or individuals which might be unfamiliar to the international audience of JGBAT. Authors may need to provide brief explanations in a footnote or an appendix.
- 13. Explanatory footnotes should be kept to a minimum and be numbered sequentially throughout the text with superscript Arabic numerals. They should be double-spaced and not include displayed formulas or tables.

REFEERING PROCEDURE

Each manuscript is blind reviewed by at least 2 subject specialists selected for their expert knowledge as well as the Editor-in-Chief. The authors of each manuscript are provided with each reviewer's completed Review Form which includes qualitative comments and suggestions.

Revised manuscripts are reviewed by the original referees. Revised manuscripts include a detailed set of notes to each reviewer.

The refereeing process takes about 6-8 weeks from date of receipt of the article to communication of initial decision to the author.

The Editor-in-Chief reserves the right to refuse any manuscripts, whether an invitation or otherwise, and to make suggestions and/or modifications before publication.

The Editor-in-Chief is always happy to discuss contributions before submission.



Corporate, Institution, & Library Subscription Information

Name	
Institution	
Address	
City, State, Zip	
Country	

Annual Fee \$350.00 USD

Please indicate when you want subscription to begin:

□ Spring 2023 □ Fall 2023

Please complete the subscription form and payment particulars. Then, e-mail to the Editor-in-Chief at info@gbata.org

* For subscriptions, please do not remove this page. A **<u>photo copy</u>** would be appreciated.



Individual Subscription Information

Name	
Institution	
Address	
City, State, Zip	
Country	

Annual Fee \$250.00 USD

Please indicate when you want subscription to begin:

□ Spring 2023 □ Fall 2023

Please complete the subscription form and payment particulars. Then, e-mail to the Editor-in-Chief at info@gbata.org

* For subscriptions, please do not remove this page. A **<u>photo copy</u>** would be appreciated.